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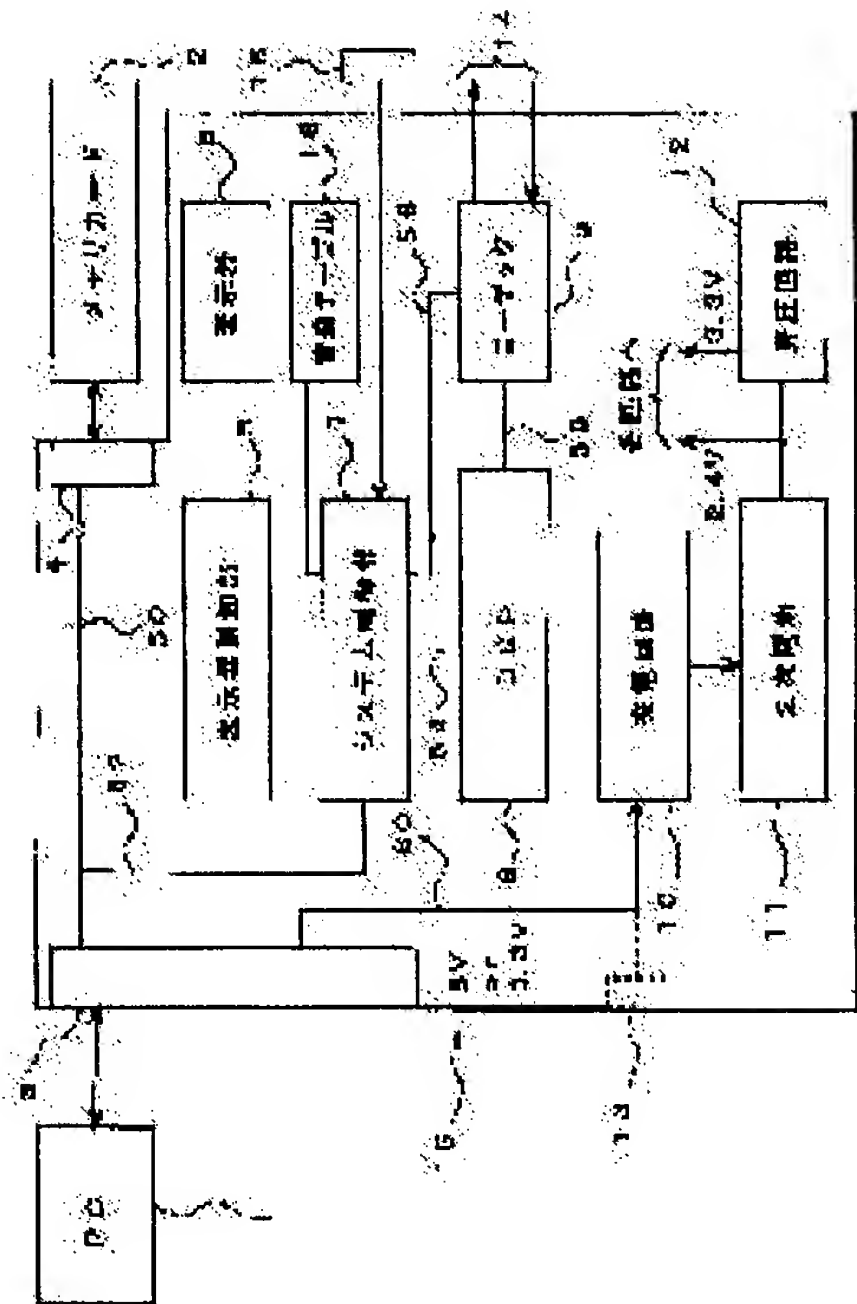
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(54) MUSIC REPRODUCING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a music reproducing device in which a desired equalizer functions for every piece of music even when a user does not perform operations by himself as to a music reproducing device reproducing music from an information storage device in which musical data are stored.  
SOLUTION: This music reproducing device is provided with a first input-output interface 3 fetching digital musical data annexed with ID information from a PC1, a DSP 8 performing the compression or expansion processing of the musical data, a second input-output interface 4 transferring the compressed musical data to a memory card 2, a musical table 18 in which plural preliminarily-stored frequency patterns are stored, the DSP 8 or a codec 9 as a working part working the musical data while selecting a prescribed frequency pattern from the musical table based on the ID information, and an input-output terminal 14 outputting the worked musical data as analog data.



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CLAIMS

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[Claim(s)]

[Claim 1]A music reproduction device which carries out the feature, comprising:

The 1st I/O interface that incorporates digital music data in which ID information accompanied from an information processor.

The compression / elongation processing part which performs compression or elongation processing of said music data

The 2nd I/O interface that transmits said compressed music data to a recording medium.

A musical table which stored two or more frequency patterns memorized beforehand, a processing section which chooses said predetermined frequency pattern from said musical table based on said ID information, and processes said music data, and an outputting part which changes said processed music data into analog data, and outputs it.

[Claim 2]A music reproduction device which is the music reproduction device according to claim 1, and is characterized by storing said frequency pattern in said musical table from said information processor via said 1st I/O interface.

[Claim 3]A music reproduction device which is the music reproduction device according to claim 1 or 2, and is characterized by said recording medium comprising solid-state memory.

[Claim 4]A music reproduction device which is the music reproduction device according to claim 3, and is characterized by forming said recording medium from said 2nd I/O interface so that extraction and insertion is possible.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the music reproduction device which plays music from the information storage device with which the data (henceforth music data) of a sound, music, etc. was memorized.

[0002]

[Description of the Prior Art]Although magnetic tape or the magneto-optical disc which can be written, the compact disk, or the mini disc (it is hereafter named MD generically) is generally used as an information recording medium of the information storage/playback equipment which records / plays music data, Semiconductor memory devices (solid-state memory), such as a flash memory in which small rewriting is possible, attract attention as a recording medium of music data with large scale with improvement in semiconductor accumulation art in recent years. The music reproduction device (portable audio playback equipment) built in the main part by using a semiconductor memory device as a recording medium in connection with it is appearing. Since neither a cassette tape nor a recording medium like MD which makes it rotate and transmits information is used, this playback equipment is strong also to vibration as it is not necessary to provide a rolling-mechanism system. Although especially MD has a problem of skipping by vibration and needs to form the buffer for the prevention from skipping in a device, in the above-mentioned playback equipment, since the necessity does not exist, either, it can simplify an equipment configuration, and has an advantage also according to the cost aspect.

[0003]By the way, a magnetic disk drive built in the information processor (for example, it is called a personal computer and following PC for short). It makes it memorize music data (it is hereafter called HDD), and music can be played and it can be heard now from the loudspeaker connected to PC using music reproduction software, or an earphone jack. When music data is memorized as a WAV (ADPCM system: analogue-to-digital pulse code modulation method) file, the storage capacity of about 10 MB is needed by the music for 1 minute, for example. then, he compresses music data in 1 MB/about 1 minute using MP3 (MPEG1 AudioLayer 3) etc. which are the international-standards methods of the audio compression art which ISO (International Organization for Standardization) defined, for example, and is trying to make HDD memorize

[0004]Since the storage capacity of music data can be made small to about 1/10, maintaining high quality if this audio compression art is used, these days, It can be made to transmit and memorize, it can reproduce outdoors etc. and the music data of MP3 stored in the above-mentioned portable audio playback equipment which contained the flash memory etc. by HDD of PC can be heard now.

[0005]In order to use this portable audio playback equipment, PC which accumulated the music data of MP3 in HDD is indispensable. PC and an audio playback unit A parallel interface (I/F), It is connected by serial I/F or PC card I/F based on a PCMCIA (Personal Computer Memory Card International Association) standard, The music data of MP3 memorized by HDD using the transmission software started on PC is transmitted to the flash memory by the side of playback equipment, etc.

[0006]

[Problem(s) to be Solved by the Invention]By the way, generally, regenerative data reproduces a fundamental tone faithfully, and the equalizer function of playback equipment is thought as important, so that it is quality. An equalizer function is a function in which the original frequency of music data can be changed at the time of reproduction of music data, Change the frequency of a fundamental tone so that the atmosphere of the genres (for example, jazz, the blues, etc.) of music may be suited most, or, It can use in order to amend

change of the tone quality depending on the arrangement place of the reproduction loudspeaker in the audio playback unit for mount, etc., to change the textures of music by a user's original liking or to amend the variation in a reproduced sound still more peculiar to playback equipment.

[0007]However, in the present portable audio playback equipment, though the equalizer function is not provided or it is provided, it has only the function of the grade which divides from a low-pitched sound region to upper register into several steps, and carries out level adjustment. In order that this may think portability as important, the case of the remote control which accompanies a playback equipment case and a device is difficult to arrange the equalizer which needed to make it as small as possible and was provided with sufficient function for these small cases, and. The usual user operates an equalizer outdoors etc. and it is thought that it is actually difficult to double tone quality correctly for every music, or to amend tone quality, and seldom being used after all is a cause. It is also dangerous to operate an equalizer during operation also in the case of the audio playback unit for mount, and it is considered [ not being used after all in many cases and ]. However, desire of the user who would like to hear it even if the outstanding music of tone quality which utilized the above-mentioned equalizer function enough is in the outdoors by one side is strong.

[0008]Even if the user itself does not operate the purpose of this invention, there is in providing the music reproduction device with which a desired equalizer function works for every music.

[0009]

[Means for Solving the Problem]The 1st I/O interface in which the above-mentioned purpose incorporates digital music data in which ID information accompanied from an information processor, The compression / elongation processing part which performs compression or elongation processing of said music data, and the 2nd I/O interface that transmits said compressed music data to a recording medium, A musical table which stored two or more frequency patterns memorized beforehand, and a processing section which chooses said predetermined frequency pattern from said musical table based on said ID information, and processes said music data, It is attained by music reproduction device which carries out the feature of having an outputting part which changes said processed music data into analog data, and outputs it.

[0010]Since it has the musical table which stored two or more frequency patterns memorized beforehand, a predetermined frequency pattern is chosen based on ID information for every music and this invention processes music data of the music concerned, even if the user itself does not operate it, it can use a desired equalizer function for every music.

[0011]It is a music reproduction device of above-mentioned this invention, and said frequency pattern is stored in said musical table from said information processor via said 1st I/O interface.

[0012]Thus, according to this invention, a user can create newly a frequency pattern memorized by musical table in a music reproduction device on an information processor, or it can edit the existing frequency pattern, and can store it in a musical table.

[0013]Said recording medium comprises solid-state memory. From said 2nd I/O interface, said recording medium is formed so that extraction and insertion is possible. Also outdoors by using solid-state memory so that extraction and insertion is possible, two or more music can be listened to now.

[0014]

[Embodiment of the Invention]The music reproduction device by the 1 embodiment of this invention is explained using drawing 1 and drawing 4. Since the music reproduction device by this embodiment is realized as a PC card, the outline of a PC card is explained first. A PC card is used for information processors, such as noncommercial audio equipment and a digital still camera, by making into the start PC which processes various information, including a sound, music or a character, picture information, etc., equipping them with it removable, It is used for improvement in the throughput of the various processings which an information processor performs, or extension of a processing capability.

[0015]A PC card The beginning, In order to create the standard of the memory card for PC. International standardization is carried out based on the common protocol (PC Card Standard) which PCMCIA (Personal Computer Memory Card International Association) which is the provided organization announced. The PC card is used for mainly portable small PC. The physical specification (appearance shape) of a PC card based on the standard of PCMCIA is a card shape with a length of 85.6 mm and a width of 54.0 mm, and is classified into Type I, Type II, and Type III by difference of thickness. The two-piece connector which has 68 pins is adopted as the connector of a PC card. A PC card can be drawn out from a PC Card slot, when it is used inserting in the PC Card slot of PC card interface provided in portable PC etc. and does not use the connector concerned for it.



[0016] Thus, since a PC card can be detached and attached easily, and is small and it excels in portability, An auxiliary storage unit with which the use was provided with hard disk drives, such as not only the semiconductor memory card as an auxiliary storage unit but a magnetic disk, Or it is spreading also as communication of a modem function, a LAN (Local Area Network) function, etc., the network related field, and a music card further for music admiration. Are also expanding the field of application for which a PC card is used, and it is not restricted to portable small PC, For example, as the music which it was used for music, such as digital audio apparatus and a digital still camera, and an image information processing unit, was removable, and was excellent in portability, and an image storage, Or it is increasingly used also as a data transfer unit for transmitting the picture memorized to the camera to PC etc.

[0017] In order to give desired throughput and processing capability to an information processor conventionally, The substrate which has a predetermined function into an expansion bus slot must be attached, or the built-in board module linked to the mother board of PC must be attached, To having followed difficulty on substitution and the portability of the substrate, if it is a PC card, it has an ease of handling that desired throughput and a function can be immediately obtained only by exchanging the PC card inserted in a PC Card slot. There are a method which inserts the attachment and detachment of a PC card to an information processor, and is drawn out, a method placed and fixed, etc.

[0018] PC miniaturized more with development of the high integration art of a semiconductor device in recent years, Or an information processor also including consumer appliances, such as a digital still camera, a digital camcorder, or portable audio apparatus, is developed, In addition to the conventional PC card based on the standard of PCMCIA which meant use to PC, the appearance of the PC card miniaturized more came to be demanded. For this reason, the standard of the following small cards is advocated now and it has appeared in a commercial scene as a product actually.

[0019] It is "Compact Flash (registered trademark of SanDisk)" which CFA (Compact Flash Association) advocates [ 1st ] first, and the outside dimension of this is the small flash memory card of 36.4 [ (mm) ] x 42.8 (mm) x3.3 (mm). The 2nd Matsushita Battery Industrial Co., Ltd., Japan Electronic Industry Development Association (JEIDA:Japan Electronic Industry Development Association), it is "Small PC Card" which PCMCIA advocates, and an outside dimension is 45.0 [ (mm) ] x 42.8 (mm) x5.0 (mm), and this is a size for the minute of the PC card of the former [ length ] half [ about ]. The 3rd is Miniature Card Implementers Forum and "Minituare Card" by PCMCIA, and the outside dimension of this is a small card of 38 [ (mm) ] x 33 (mm) x3.5 (mm).

[0020] It is "SmartMedia (registered trademark of Toshiba Corp.)" of SSFDC Forum the 4th, and the outside dimension of this is a flash EEPROM card with a capacity of 2 MB – about 16 MB in 37 [ (mm) ] x 45 (mm) x0.67 (mm). The 5th is "MMC (MultiMedia Card)" which MultiMedia Card Association advocates, and the outside dimension of this is a flash EEPROM card with a capacity of about 10 MB in 24 [ (mm) ] x 32 (mm) x1.4 (mm). It is "the memory stick (trademark of Sony Corp.)" which Sony Corp. advocates in the 6th, and the outside dimension of this is a flash EEPROM card with a capacity of about 8 MB in 21.5 [ (mm) ] x 50 (mm) x2.8 (mm). In addition, the small PC card provided with the hard disk drive by magnetic recording is also developed. In this application, it is named a PC card generically including the small card which has the function explained above, and the card which is similar to these further. A serial, parallel one, USB, IEEE1394, etc. can be used as an interface of PC.

[0021] This embodiment explains taking the case of the music reproduction device of the PC card based on the standard of PCMCIA. Drawing 1 shows the outline composition of music reproduction device 15 inside seen from the plane direction with two or more blocks. As shown in drawing 1, the music reproduction device 15 has 1st I/O interface 3 as an information processor that transmits digital data between PC1. Although PC1 omitted the graphic display, it has PC card interface and a PC Card slot. 1st I/O interface 3 has a two-piece connector of 68 pins as a PC card physical layer interface which connects with PC card interface of PC1 physically.

[0022] The music reproduction device 15 has 2nd I/O interface 4 that transmits digital data between external information recording media. As an external information recording medium, various kinds of memory cards 2, for example, above-mentioned "Compact Flash (henceforth CF)", "SmartMedia", etc., can be used. In this embodiment, it explains by the case where CF which has 50 pin connectors is used for the memory card 2 as a physical layer interface. Therefore, 2nd I/O interface 4 has a physical layer interface which consists of a connector of 50 pins which connect the memory card (CF) 2 physically.

[0023] The signal wire 50 is connected between 1st and 2nd I/O interfaces 3 and 4. Here, the signal wire 50

shows the aggregate of two or more signal wires, and shows it as one solid line for convenience in drawing 1. The graphic display of other signal wires explained after this is also the same. At least a part of this signal wire 50 branches, and it is connected to the system control part 7 as the signal wire 52. The system control part 7 controls 1st and 2nd I/O interfaces 3 and 4 via the signal wire 52. Data can be sent [ the system control part 7 ] and received between PC1 via 1st I/O interface 3, or data can be sent now and received between the memory cards 2 via 2nd I/O interface 4. By control of the system control part 7, 1st and 2nd I/O interfaces 3 and 4 can be directly linked via the signal wire 50, and immediate data can be sent now and received between PC1 and the memory card 2.

[0024] Thus, the signal wires 50 and 52 are used as the data/an address bus line into which the data signal or address signal which should be transmitted between PC1, the memory card 2, and the system control part 7 flows. The signal wire 52 also has the controlling signal line with which the control signal for controlling 1st and 2nd I/O interfaces 3 and 4 is transmitted. The system control part 7 also performs control to each circuit in the music reproduction device 15 besides control of 1st and 2nd I/O interfaces 3 and 4.

[0025] The music reproduction device 15 has the display for indication 6 which consists of liquid crystal displays, for example. It can electrically be connected with the display-for-indication control section 5, and the display for indication 6 can display now the track name of the music currently played, the regeneration time of music, the residue of a cell, etc. The track name at least is included in the music data read from PC1 or the memory card 2 via 1st or 2nd I/O interface 3 and 4 among these indicative datas. For example, when music data is recorded by the MP3 format, the information called an "ID3 tag" to a data file is written in. The index byte (henceforth ID information) who shows the genre of the music classified into 148 other than a player's name or a track name of 0-147 is stored in the ID3 tag. The system control part 7 sends these indicative datas to the display-for-indication control section 5 from the read music data. The display-for-indication control section 5 controls a liquid crystal display so that a display predetermined in the sent indicative data in the display-for-indication 6 top is made.

[0026] The music reproduction device 15 has DSP8 for audios, and the codec 9. DSP8 for audios is controlled by the signal wire 54 from the system control part 7. The codec 9 is controlled by the signal wire 56 from the system control part 7. It is connected with the signal wire 58 between DSP8 and the codec 9. These signal wires 54, 56, and 58 have data/address bus line which sends and receives a music data signal or an address signal between the system control part 7, and DSP8 and the codec 9.

[0027] The outgoing end of the codec 9 is connected to the input/output terminal 14. Music is outputted as analog data from this input/output terminal 14, or the D/A (digital analog) converter and the A/D (analogue to digital) converter are built in the codec 9 so that the music data of an analog may be inputted conversely and it may change into digital data. The graphic display is omitted although sound ROM for reproducing MIDI, DRAM for effects for processing a WAV file by echo processing etc., etc. are connected to DSP8.

[0028] If compression processing is carried out by MP3 etc., it will be sent to DSP8 via the signal wire 54, and, as for the music data which the system control part 7 received via the signal wire 52 when playing music, elongation processing will be performed. The music data by which elongation processing was carried out is sent to the codec 9 via the signal wire 58, and is outputted as a music signal of an analog from the input/output terminal 14. The music data which has not received compression processing is directly inputted into the codec 9 via the signal wire 56 from the system control part 7, and is outputted as a music signal of an analog from the input/output terminal 14.

[0029] The system control part 7 has the musical table 18. Two or more frequency patterns which function as an equalizer which adds change to the original frequency characteristic of the music data reproduced are stored in the musical table 18. Here, the example of a frequency pattern is explained using drawing 2. As for drawing 2 (a), the genre of music shows the frequency pattern of the "blues." The horizontal axis is indicating the frequency from 20 Hz of an auditory sensation area to 20 kHz by linear. The vertical axis is indicating the sound pressure level by the log. In this example, to the "blues", it is adjusted so that between low-pitched sound and inside sounds and between an inside sound and loud sounds may be relatively set to a sound pressure level lower than others. Similarly, drawing 2 (b) is a case where the genre of music is a "disco", and, as for drawing 2 (c), shows the frequency pattern in the case of "jazz."

[0030] In the musical table 18, a frequency pattern which is matched with the ID information described by the above-mentioned MP3 tag, for example by 1 to 1, and is different, respectively is stored. If reproduction of music data is started, a predetermined frequency pattern will be chosen from the musical table 18 by the system control part 7 based on the ID information for every music, and the music data of the music concerned



will be processed. In DSP8 or the codec 9, musical processing based on a predetermined frequency pattern is performed based on control of the system control part 7.

[0031] Thus, in the music reproduction device by this embodiment, 1st I/O interface 3 that incorporates from PC1 the digital music data in which ID information accompanied, DSP8 which performs compression or elongation processing of music data, and 2nd I/O interface 4 that transmits the compressed music data to the memory card 2, The musical table 18 which stored two or more frequency patterns memorized beforehand, It has DSP8 as a processing section or the codec 9 which chooses a predetermined frequency pattern from a musical table based on ID information, and processes music data, and the input/output terminal 14 which outputs the processed music data as analog data.

[0032] Thus, in the music reproduction device by this embodiment. Since it has the musical table which stored two or more frequency patterns memorized beforehand, a predetermined frequency pattern is chosen based on the ID information for every music and the music data of the music concerned is processed, even if the user itself does not operate it, a desired equalizer function can be used for every music.

[0033] The frequency pattern stored in the musical table 18 can be stored now in the musical table 18 from PC1 via 1st I/O interface 3. Namely, a user can create newly the frequency pattern stored in the musical table 18 on PC1, or it can edit the existing frequency pattern, and can store it now in the musical table 18. Since the obtained frequency pattern is stored in the musical table 18 from PC1 via 1st I/O interface 3, when using the music reproduction device 15, the necessity that a user does adjustment of an equalizer etc. directly to the music reproduction device 15 is not produced at all.

[0034] Next, the case where the analog sound easy data inputted into the input/output terminal 14 is recorded is explained briefly. First, after the music data inputted into the input/output terminal 14 is changed into digital data by the codec 9, when performing and recording a data compression, it is sent to DSP8 via the signal wire 58. After predetermined compression processing is performed to the music data sent to DSP8, it is sent to the system control part 7 through the signal wire 54. When recording as non compression data, data is outputted to the direct system control section 7 from the signal wire 56 without DSP8. The music data for record sent to the system control part 7 is outputted and recorded on PC1 or the memory card 2 by control of the system control part 7 via either of 1st or 2nd I/O interface 3 and 4.

[0035] The signal from the control switch 16 which the user of the music reproduction device 15 uses inputs into the system control part 7. The mechanical switch formed in the case exterior of the music reproduction device 15 may be sufficient as the control switch 16, and, specifically, it may be a remote controlled switch etc. which were formed in the middle of the cable of the headphone and earphone which were connected to the output terminal of the input/output terminal 14. It is possible to equip the control switch 16 with various switching functions if needed. For example, it may be made to send out the signal for changing the music data which changes ON and OFF of the power supply of the music reproduction device 15, changes a recording mode and reproduction mode, or is played, or performing sickle hocked leg \*\*\*\* to the system control part 7. Or the signal for changing the indicative data displayed on the already explained display for indication 6 may be sent out to the system control part 7. The system control part 7 controls each circuit to be in a desired state in response to the signal from the control switch 16. For example, when carrying out music reproduction, without using an equalizer function, based on directions of the user from the control switch 16, the system control part 7 changes the frequency pattern to be used to a flat frequency characteristic pattern compulsorily.

[0036] Next, the power supply of the music reproduction device 15 is explained. The rechargeable battery 11 for supplying electric power to each circuit in the music reproduction device 15 is built in the music reproduction device 15. A nickel hydride battery, a lithium ion, etc. can be used as the rechargeable battery 11. The music reproduction device 15 contains the charge circuit 10 for charging the rechargeable battery 11. The charge circuit 10 is connected to the power source wire 60. The power source wire 60 is connected to the predetermined pin of the connector of 1st I/O interface 3. If the music reproduction device 15 is inserted in the PC Card slot which PC1 does not illustrate and 1st I/O interface 3 is connected to the PCMCIA-interface of PC1, The voltage of 5V or 3.3V is supplied to the predetermined pin of the connector of 1st I/O interface 3 from PC1 side. Therefore, if the music reproduction device 15 is connected to PC1, predetermined voltage can be impressed to the charge circuit 10 from PC1 side via the signal wire 60, and the rechargeable battery 11 can be charged based on it.

[0037] As opposed to each circuit, the voltage of 2.4V can be impressed from the rechargeable battery 11 side, charging the rechargeable battery 11. It is connected also to the booster circuit 12 and the voltage of the

booster circuits 12-3.3V can impress now the outgoing end of the rechargeable battery 11 to each circuit. Thus, since supply of a power supply can be received from PC1 in the music reproduction device 15 by this embodiment, there is no consumption of the built-in rechargeable battery 11. When an external AC adapter (not shown) will need to be used, it is easy to be natural even if it forms the external AC adapter terminal 13, as the figure destructive line showed.

[0038]Next, the constructional example of the music reproduction device 15 by this embodiment is explained using drawing 3. Drawing 3 (a) is an exploded perspective view of the music reproduction device 15 constituted from Type II in the physical specification of a PC card based on the standard of PCMCIA. Drawing 3 (b) is an exploded perspective view showing the structure of CF as the memory card 2 used inserting in the music reproduction device 15 by this embodiment. The memory card (CF) 2 is provided with the following in drawing 3 (a) and (b).

Electronic parts 26 mounted on the substrate, such as a memory controller and a memory chip.

The connector 17 of 50 pins.

The metal panel 19 which forms rear surface both sides of a case.

Immobilization of the metal panel 19 will form the guide groove 38 which can insert the memory card 2 in the both side surfaces of the figure Nakaya seal direction of a case along with the guide formed with the frame 20 of the music reproduction device 15.

[0039]Two or more electronic parts 23 in which the music reproduction device 15 includes the system control part 7 explained by drawing 1 on the substrate 22, a charge circuit, etc. are mounted. The rechargeable battery 11 is also carried on the substrate 22. The connector which constitutes the physical layer interface of 1st I/O interface 3 is attached to the end surface of the substrate 22, and the connector which constitutes the physical layer interface of 2nd I/O interface 4 is attached to the other end face which counters.

[0040]The periphery of the substrate 22 with which these parts were mounted is inserted in the method of the inside of the fork part 39 of two of the frame 20, and the metal panel 21 which constitutes rear surface both sides of a case is put from the upper and lower sides of the frame 20, and it fixes. The space which can insert the memory card 2 comprises the two fork parts 39 of the frame 20, and a connector area by the side of 2nd I/O interface 4 of the substrate 22. If alignment of the guide groove of the memory card 2 and the guide of each method of the inside of a fork of the frame 20 is carried out and the memory card 2 is fitted over this space, the connector 17 and the connector area by the side of 2nd I/O interface 4 are connectable.

[0041]The input/output terminal 14 which can connect headphone, a microphone, etc., and the control switch 16 are formed in both the fork tip part of the frame 20. In both forks of the frame 20, metallic wiring insulated from the frame 20 is given, and the input/output terminal 14 and the control switch 16 are electrically connected with the prescribed circuit of the electronic parts 23 on the substrate 22 by this metallic wiring.

[0042]Next, operation of the music reproduction device 15 by this embodiment is explained using drawing 1 thru/or drawing 4. Drawing 4 is PC1, the music reproduction device 15, and a figure showing the state of extraction and insertion of the memory card 2. First, the music reproduction device 15 shown in drawing 4 is inserted in PC Card slot 31 of PC1, and operation in the state where the memory card 2 is inserted in the music reproduction device 15 is explained. For example, 1st I/O interface 3 was inputted from PC1, error detection/protocol processing of a data signal are performed, or it performs control for PC1 side to carry out device recognition of the music reproduction device 15. In order to realize the control procedure with which 1st I/O interface 3 passed 1st I/O interface 3 of the system control part 7 and PC1 at this time, the data sent out from the system control part 7 is changed into data suitable for the PCMCIA-interface by the side of PC1. 1st I/O interface 3 changes the data by which was sent out from PC1 and parallel conversion was carried out via the 1st input/output interface 3, and a command into the form which the system control part 7 can interpret, or performs processing changed into an electric interface suitable for the system control part 7.

[0043]For example, 2nd I/O interface 4 was inputted from the memory card 2, error detection/protocol processing of a data signal are performed, or it performs control for the memory card 2 side to carry out device recognition of the music reproduction device 15. In order to realize the control procedure with which 2nd I/O interface 4 passed 2nd I/O interface 4 of the system control part 7 and the memory card 2 at this time, the data sent out from the system control part 7 is changed into data suitable for the interface by the side of the memory card 2. 2nd I/O interface 4 changes the data sent out from the memory card 2, and a command into the form which the system control part 7 can interpret, or performs processing changed into an electric interface suitable for the system control part 7.



[0044] Thus, the music reproduction device 15 by this embodiment performs the same interface operation as the conventional PC card by inserting and connecting with the slot 31 of a PC card drive device provided in PC1. Although this embodiment explains to 1st I/O interface 3 taking the case of the case where it has PC card interface based on the standard of PCMCIA, Other already explained PC cards, for example, "Compact Flash", It is easy to be natural as the interface used for "Small PC Card", "Minituare Card", "SmartMedia", "MultiMedia Card", and a "memory stick" is given to 1st I/O interface 3. Furthermore, 1st I/O interface 3 is not restricted to PC card interface, The interface corresponding to a USB (Universal Serial Bus) standard may be used, or it is easy to be natural even if constituted from an interface corresponding to an IEEE1394 standard, etc.

[0045] Thus, after inserting the memory card 2 in the music reproduction device 15, if the music reproduction device 15 is inserted in PC Card slot 31 of PC1 and it electrically connects with it, the exchange of card recognition information will be performed via CPU of PC1, and the controller in the memory card 2. And via the predetermined power pin in the connector of PC1 to 1st I/O interface 3, voltage is impressed to the charge circuit 10, a power supply is supplied to the rechargeable battery 11 at the same time it checks connection of the memory card 2, and electric power is supplied to each circuit from the rechargeable battery 11.

[0046] Now, if the above interface operations are completed, the music data memorized by the magnetic disk drive built in PC1 will be taken out, The thing of the memory card 2 to do for solid MEMORIHE record becomes possible at this order via 1st I/O interface 3, the signal wire 50, and 2nd I/O interface 4.

[0047] It is possible to record on that magnetic disk drive that took out the music data in the memory card 2, and was conversely built in PC1 at this order via 2nd I/O interface 4, the signal wire 50, and 1st I/O interface 3. In the direct data transfer of these PC1 and memory cards 2, it is also possible to perform encryption processing using the system control part 7 to the music data transmitted. Although control at the time of transmitting music data between PC1 and the memory card 2 is performed by the system control part 7, the control by the system control part 7 is started by the directions from PC1, or the directions from the control switch 16.

[0048] Next, the case where music data is inputted and recorded from the input terminal of the input/output terminal 14 is explained. First, the inputted music data of an analog is changed into digital data by the codec 9. In DSP8 already explained performing a data compression and recording on the magnetic disk drive of PC1 if required, 1st I/O interface 3 is activated via the system control part 7, and it outputs music data to PC1 side. Also when recording on the memory card 2, if required, DSP8 will perform a data compression, 2nd I/O interface 4 is activated via the system control part 7, and music data is outputted to the memory card 2. The information on an "ID3 tag" etc. is not added to the music data inputted from the input/output terminal 14. Then, it is also possible to operate the control switch 16, to choose arbitrary patterns from the frequency pattern of a large number already stored in the musical table 18, and to add the information which shows the frequency pattern concerned to the music data recorded on the memory card 2.

[0049] Next, an earphone etc. are connected to the output terminal of the input/output terminal 14, and the case where music is played and listened to is explained. First, in order to reproduce the music data recorded on the magnetic disk drive in PC1, music data is inputted via 1st I/O interface 3. Through the signal wire 52, via the system control part 7, if the inputted music data is required, it will perform data decompression by DSP8 already explained, and will output it as music data of an analog by the codec 9. When reproducing the music data recorded on the memory card 2, it is also the same as that of \*\*\*\* except the point of inputting music data via 2nd I/O interface 4.

[0050] If the system control part 7 receives directions of a reproduction start of music data in the above operation, A predetermined frequency pattern is chosen from the musical table 18 based on the ID information of the music to reproduce, and it directs to process the music data of the music concerned by a predetermined frequency pattern to DSP8 or the codec 9. DSP8 or the codec 9 functions as an equalizer to a fundamental tone based on the specified frequency pattern. Thus, since a predetermined frequency pattern is chosen based on the ID information for every music and the music data of the music concerned is processed, even if the user itself does not do any operation, an equalizer function comes to commit him automatically.

[0051] Next, the procedure of storing a desired frequency pattern in the musical table 18 using PC1 is explained. A user can create newly the frequency pattern stored in the musical table 18 on PC1, or it can edit the existing frequency pattern, and can store it now in the musical table 18. Therefore, double with the atmosphere of the genre of music, amend change of the tone quality depending on the arrangement place of

the reproduction loudspeaker, change the textures of music by a user's original liking, or further, The new production of a frequency pattern or edit which amends the variation in a reproduced sound peculiar to playback equipment can be easily obtained using a simulation etc. on PC1. The obtained frequency pattern is stored in the musical table 18 from PC1 via 1st I/O interface 3.

[0052]The system control part 7 performs control which changes the record/reproduction mode from a user through the control switch 16, or changes whether the medium of record/playback is used as the magnetic disk of PC1, or the memory card 2 is used. The system control part 7 controls the display-for-indication control section 5, and displays information suitably required for the display for indication 6 according to the directions from the control switch 16. In the midst of the above operation, voltage is impressed to the charge circuit 10 via 1st I/O interface 3 from PC1 side, and the rechargeable battery 11 supplies electric power to each circuit in the music reproduction device 15, charging.

[0053]Next, in drawing 4, the music reproduction device 15 is drawn out from PC Card slot 31 of PC1, and the memory card 2 explains the case where the music reproduction device 15 is operated in the state where it is inserted in the music reproduction device 15. First, an input of the instructions which make one the power supply of the music reproduction device 15 when a user operates the control switch 16 will supply electric power to each circuit from the rechargeable battery 11. At this time, control by the system control part 7 is performed so that 1st I/O interface 3 may suspend a function substantially. On the other hand, 2nd I/O interface 4 is the same operation as \*\*\*\*, performs error detection/protocol processings, such as a data signal from the memory card 2, or performs control for the music reproduction device 15 side to carry out device recognition of the memory card 2.

[0054]When reproducing the music data which connects an earphone etc. to the output terminal of the input/output terminal 14, and is recorded on the memory card 2, Via [ 2nd I/O interface 4 the signal wire 52 and the system control part 7 ] and, if required, data decompression by DSP8 will also be performed and analog sound easy data will be outputted via the codec 9.

[0055]When inputting and recording music data from the input terminal of the input/output terminal 14, the inputted music data of an analog is changed into digital data by the codec 9. If required, DSP8 will perform a data compression, 2nd I/O interface 4 is activated via the system control part 7, and music data is outputted to the memory card 2.

[0056]In the above operation, if reproduction of music data is started, the system control part 7, The data of the selected frequency pattern is outputted to DSP8 or the codec 9 so that a predetermined frequency pattern may be chosen from the musical table 18 based on the ID information for every music and the music data of the music concerned may be processed. Also in this case, a predetermined frequency pattern is chosen based on the ID information for every music, the music data of the music concerned is processed, and by \*\*, even if the user itself does not do any operation, he can use a desired equalizer function for every music.

[0057]In the above operation, the system control part 7 performs control for changing the record/reproduction mode from a user through the control switch 16, or changing record/reproduction medium to another memory card 2. The system control part 7 controls the display-for-indication control section 5, and displays information suitably required for the display for indication 6 according to the directions from the control switch 16. While the above operation is performed, electric power continues being supplied from the rechargeable battery 11 to each circuit. According to the music reproduction device 15 by this embodiment, two or more music data can be substituted and heard by substituting the memory card 2.

[0058]Not only the above-mentioned embodiment but various modification is possible for this invention. For example, in the above-mentioned embodiment, although the example which records music data on the memory card 2 using 2nd I/O interface 4 was shown, this invention is not restricted to this. For example, it may be made to build in another memory storage in the music reproduction device 15. In this case, the memory storage which memorizes music etc. may be formed only in the music reproduction device 15, without [ that is, ] establishing 2nd I/O interface 4, and it may be made to use together with the external memory card 2 with 2nd I/O interface 4. Even when the music reproduction device 15 is drawn out from PC1 and there is no memory card 2, it comes to be able to perform musical record/playback by making such memory storage build in.

[0059]Although fixed in the music reproduction device 15, this invention is not restricted to this but it may be made for the rechargeable battery 11 to carry the rechargeable battery 11 dismountable in the above-mentioned embodiment. If the rechargeable battery 11 is made dismountable, the spare rechargeable battery

11 can be made to charge using an external AC adapter and battery charger. It is also possible to use a dry cell instead of the rechargeable battery 11. However, in order to use together the rechargeable battery 11 and a dry cell, when a dry cell is used, it is desirable to form the mechanism in which the charging function of the charge circuit 10 is stopped.

[0060]The above-mentioned embodiment explained taking the case of the data compression system by MP3. Therefore, when choosing the frequency pattern in the musical table 18, the ID information of ID tag 3 in an MP3 data file is used, but it is also possible for this invention not to be restricted to this, of course, but to use the ID information in another data file form.

[0061]

[Effect of the Invention]According to [ above passage ] this invention, even if the user itself does not operate it, the music reproduction device with which a desired equalizer function works for every music is realizable.

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[Translation done.]



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TECHNICAL FIELD

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[Field of the Invention]This invention relates to the music reproduction device which plays music from the information storage device with which the data (henceforth music data) of a sound, music, etc. was memorized.

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PRIOR ART

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[Description of the Prior Art]Although magnetic tape or the magneto-optical disc which can be written, the compact disk, or the mini disc (it is hereafter named MD generically) is generally used as an information recording medium of the information storage/playback equipment which records / plays music data, Semiconductor memory devices (solid-state memory), such as a flash memory in which small rewriting is possible, attract attention as a recording medium of music data with large scale with improvement in semiconductor accumulation art in recent years. The music reproduction device (portable audio playback equipment) built in the main part by using a semiconductor memory device as a recording medium in connection with it is appearing. Since neither a cassette tape nor a recording medium like MD which makes it rotate and transmits information is used, this playback equipment is strong also to vibration as it is not necessary to provide a rolling-mechanism system. Although especially MD has a problem of skipping by vibration and needs to form the buffer for the prevention from skipping in a device, in the above-mentioned playback equipment, since the necessity does not exist, either, it can simplify an equipment configuration, and has an advantage also according to the cost aspect.

[0003]By the way, a magnetic disk drive built in the information processor (for example, it is called a personal computer and following PC for short). It makes it memorize music data (it is hereafter called HDD), and music can be played and it can be heard now from the loudspeaker connected to PC using music reproduction software, or an earphone jack. When music data is memorized as a WAV (ADPCM system: analogue-to-digital pulse code modulation method) file, the storage capacity of about 10 MB is needed by the music for 1 minute, for example. then, he compresses music data in 1 MB/about 1 minute using MP3 (MPEG1 AudioLayer 3) etc. which are the international-standards methods of the audio compression art which ISO (International Organization for Standardization) defined, for example, and is trying to make HDD memorize

[0004]Since the storage capacity of music data can be made small to about 1/10, maintaining high quality if this audio compression art is used, these days, It can be made to transmit and memorize, it can reproduce outdoors etc. and the music data of MP3 stored in the above-mentioned portable audio playback equipment which contained the flash memory etc. by HDD of PC can be heard now.

[0005]In order to use this portable audio playback equipment, PC which accumulated the music data of MP3 in HDD is indispensable. PC and an audio playback unit A parallel interface (I/F), It is connected by serial I/F or PC card I/F based on a PCMCIA (Personal Computer Memory Card International Association) standard, The music data of MP3 memorized by HDD using the transmission software started on PC is transmitted to the flash memory by the side of playback equipment, etc.

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[Translation done.]

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EFFECT OF THE INVENTION

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[Effect of the Invention]According to [ above passage ] this invention, even if the user itself does not operate it, the music reproduction device with which a desired equalizer function works for every music is realizable.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention]By the way, generally, regenerative data reproduces a fundamental tone faithfully, and the equalizer function of playback equipment is thought as important, so that it is quality. An equalizer function is a function in which the original frequency of music data can be changed at the time of reproduction of music data, Change the frequency of a fundamental tone so that the atmosphere of the genres (for example, jazz, the blues, etc.) of music may be suited most, or, It can use in order to amend change of the tone quality depending on the arrangement place of the reproduction loudspeaker in the audio playback unit for mount, etc., to change the textures of music by a user's original liking or to amend the variation in a reproduced sound still more peculiar to playback equipment.

[0007]However, in the present portable audio playback equipment, though the equalizer function is not provided or it is provided, it has only the function of the grade which divides from a low-pitched sound region to upper register into several steps, and carries out level adjustment. In order that this may think portability as important, the case of the remote control which accompanies a playback equipment case and a device is difficult to arrange the equalizer which needed to make it as small as possible and was provided with sufficient function for these small cases, and. The usual user operates an equalizer outdoors etc. and it is thought that it is actually difficult to double tone quality correctly for every music, or to amend tone quality, and seldom being used after all is a cause. It is also dangerous to operate an equalizer during operation also in the case of the audio playback unit for mount, and it is considered [ not being used after all in many cases and ]. However, desire of the user who would like to hear it even if the outstanding music of tone quality which utilized the above-mentioned equalizer function enough is in the outdoors by one side is strong.

[0008]Even if the user itself does not operate the purpose of this invention, there is in providing the music reproduction device with which a desired equalizer function works for every music.

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## MEANS

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[Means for Solving the Problem]The 1st I/O interface in which the above-mentioned purpose incorporates digital music data in which ID information accompanied from an information processor, The compression / elongation processing part which performs compression or elongation processing of said music data, and the 2nd I/O interface that transmits said compressed music data to a recording medium, A musical table which stored two or more frequency patterns memorized beforehand, and a processing section which chooses said predetermined frequency pattern from said musical table based on said ID information, and processes said music data, It is attained by music reproduction device which carries out the feature of having an outputting part which changes said processed music data into analog data, and outputs it.

[0010]Since it has the musical table which stored two or more frequency patterns memorized beforehand, a predetermined frequency pattern is chosen based on ID information for every music and this invention processes music data of the music concerned, even if the user itself does not operate it, it can use a desired equalizer function for every music.

[0011]It is a music reproduction device of above-mentioned this invention, and said frequency pattern is stored in said musical table from said information processor via said 1st I/O interface.

[0012]Thus, according to this invention, a user can create newly a frequency pattern memorized by musical table in a music reproduction device on an information processor, or it can edit the existing frequency pattern, and can store it in a musical table.

[0013]Said recording medium comprises solid-state memory. From said 2nd I/O interface, said recording medium is formed so that extraction and insertion is possible. Also outdoors by using solid-state memory so that extraction and insertion is possible, two or more music can be listened to now.

[0014]

[Embodiment of the Invention]The music reproduction device by the 1 embodiment of this invention is explained using drawing 1 and drawing 4. Since the music reproduction device by this embodiment is realized as a PC card, the outline of a PC card is explained first. A PC card is used for information processors, such as noncommercial audio equipment and a digital still camera, by making into the start PC which processes various information, including a sound, music or a character, picture information, etc., equipping them with it removable, It is used for improvement in the throughput of the various processings which an information processor performs, or extension of a processing capability.

[0015]A PC card The beginning, In order to create the standard of the memory card for PC. International standardization is carried out based on the common protocol (PC Card Standard) which PCMCIA (Personal Computer Memory Card International Association) which is the provided organization announced. The PC card is used for mainly portable small PC. The physical specification (appearance shape) of a PC card based on the standard of PCMCIA is a card shape with a length of 85.6 mm and a width of 54.0 mm, and is classified into Type I, Type II, and Type III by difference of thickness. The two-piece connector which has 68 pins is adopted as the connector of a PC card. A PC card can be drawn out from a PC Card slot, when it is used inserting in the PC Card slot of PC card interface provided in portable PC etc. and does not use the connector concerned for it.

[0016]Thus, since a PC card can be detached and attached easily, and is small and it excels in portability, An auxiliary storage unit with which the use was provided with hard disk drives, such as not only the semiconductor memory card as an auxiliary storage unit but a magnetic disk, Or it is spreading also as communication of a modem function, a LAN (Local Area Network) function, etc., the network related field, and a music card further for music admiration. Are also expanding the field of application for which a PC card is

used, and it is not restricted to portable small PC. For example, as the music which it was used for music, such as digital audio apparatus and a digital still camera, and an image information processing unit, was removable, and was excellent in portability, and an image storage. Or it is increasingly used also as a data transfer unit for transmitting the picture memorized to the camera to PC etc.

[0017] In order to give desired throughput and processing capability to an information processor conventionally, The substrate which has a predetermined function into an expansion bus slot must be attached, or the built-in board module linked to the mother board of PC must be attached. To having followed difficulty on substitution and the portability of the substrate, if it is a PC card, it has an ease of handling that desired throughput and a function can be immediately obtained only by exchanging the PC card inserted in a PC Card slot. There are a method which inserts the attachment and detachment of a PC card to an information processor, and is drawn out, a method placed and fixed, etc.

[0018] PC miniaturized more with development of the high integration art of a semiconductor device in recent years. Or an information processor also including consumer appliances, such as a digital still camera, a digital camcorder, or portable audio apparatus, is developed. In addition to the conventional PC card based on the standard of PCMCIA which meant use to PC, the appearance of the PC card miniaturized more came to be demanded. For this reason, the standard of the following small cards is advocated now and it has appeared in a commercial scene as a product actually.

[0019] It is "Compact Flash (registered trademark of SanDisk)" which CFA (Compact Flash Association) advocates [ 1st ] first, and the outside dimension of this is the small flash memory card of 36.4 [ (mm) ] x 42.8 (mm) x 3.3 (mm). The 2nd Matsushita Battery Industrial Co., Ltd., Japan Electronic Industry Development Association (JEIDA: Japan Electronic Industry Development Association), it is "Small PC Card" which PCMCIA advocates, and an outside dimension is 45.0 [ (mm) ] x 42.8 (mm) x 5.0 (mm), and this is a size for the minute of the PC card of the former [ length ] half [ about ]. The 3rd is Miniature Card Implementers Forum and "Miniature Card" by PCMCIA, and the outside dimension of this is a small card of 38 [ (mm) ] x 33 (mm) x 3.5 (mm).

[0020] It is "SmartMedia (registered trademark of Toshiba Corp.)" of SSFDC Forum the 4th, and the outside dimension of this is a flash EEPROM card with a capacity of 2 MB – about 16 MB in 37 [ (mm) ] x 45 (mm) x 0.67 (mm). The 5th is "MMC (MultiMedia Card)" which MultiMedia Card Association advocates, and the outside dimension of this is a flash EEPROM card with a capacity of about 10 MB in 24 [ (mm) ] x 32 (mm) x 1.4 (mm). It is "the memory stick (trademark of Sony Corp.)" which Sony Corp. advocates in the 6th, and the outside dimension of this is a flash EEPROM card with a capacity of about 8 MB in 21.5 [ (mm) ] x 50 (mm) x 2.8 (mm). In addition, the small PC card provided with the hard disk drive by magnetic recording is also developed. In this application, it is named a PC card generically including the small card which has the function explained above, and the card which is similar to these further. A serial, parallel one, USB, IEEE1394, etc. can be used as an interface of PC.

[0021] This embodiment explains taking the case of the music reproduction device of the PC card based on the standard of PCMCIA. Drawing 1 shows the outline composition of music reproduction device 15 inside seen from the plane direction with two or more blocks. As shown in drawing 1, the music reproduction device 15 has 1st I/O interface 3 as an information processor that transmits digital data between PC1. Although PC1 omitted the graphic display, it has PC card interface and a PC Card slot. 1st I/O interface 3 has a two-piece connector of 68 pins as a PC card physical layer interface which connects with PC card interface of PC1 physically.

[0022] The music reproduction device 15 has 2nd I/O interface 4 that transmits digital data between external information recording media. As an external information recording medium, various kinds of memory cards 2, for example, above-mentioned "Compact Flash (henceforth CF)", "SmartMedia", etc., can be used. In this embodiment, it explains by the case where CF which has 50 pin connectors is used for the memory card 2 as a physical layer interface. Therefore, 2nd I/O interface 4 has a physical layer interface which consists of a connector of 50 pins which connect the memory card (CF) 2 physically.

[0023] The signal wire 50 is connected between 1st and 2nd I/O interfaces 3 and 4. Here, the signal wire 50 shows the aggregate of two or more signal wires, and shows it as one solid line for convenience in drawing 1. The graphic display of other signal wires explained after this is also the same. At least a part of this signal wire 50 branches, and it is connected to the system control part 7 as the signal wire 52. The system control part 7 controls 1st and 2nd I/O interfaces 3 and 4 via the signal wire 52. Data can be sent [ the system control part 7 ] and received between PC1 via 1st I/O interface 3, or data can be sent now and received between the



memory cards 2 via 2nd I/O interface 4. By control of the system control part 7, 1st and 2nd I/O interfaces 3 and 4 can be directly linked via the signal wire 50, and immediate data can be sent now and received between PC1 and the memory card 2.

[0024] Thus, the signal wires 50 and 52 are used as the data/an address bus line into which the data signal or address signal which should be transmitted between PC1, the memory card 2, and the system control part 7 flows. The signal wire 52 also has the controlling signal line with which the control signal for controlling 1st and 2nd I/O interfaces 3 and 4 is transmitted. The system control part 7 also performs control to each circuit in the music reproduction device 15 besides control of 1st and 2nd I/O interfaces 3 and 4.

[0025] The music reproduction device 15 has the display for indication 6 which consists of liquid crystal displays, for example. It can electrically be connected with the display-for-indication control section 5, and the display for indication 6 can display now the track name of the music currently played, the regeneration time of music, the residue of a cell, etc. The track name at least is included in the music data read from PC1 or the memory card 2 via 1st or 2nd I/O interface 3 and 4 among these indicative datas. For example, when music data is recorded by the MP3 format, the information called an "ID3 tag" to a data file is written in. The index byte (henceforth ID information) who shows the genre of the music classified into 148 other than a player's name or a track name of 0-147 is stored in the ID3 tag. The system control part 7 sends these indicative datas to the display-for-indication control section 5 from the read music data. The display-for-indication control section 5 controls a liquid crystal display so that a display predetermined in the sent indicative data in the display-for-indication 6 top is made.

[0026] The music reproduction device 15 has DSP8 for audios, and the codec 9. DSP8 for audios is controlled by the signal wire 54 from the system control part 7. The codec 9 is controlled by the signal wire 56 from the system control part 7. It is connected with the signal wire 58 between DSP8 and the codec 9. These signal wires 54, 56, and 58 have data/address bus line which sends and receives a music data signal or an address signal between the system control part 7, and DSP8 and the codec 9.

[0027] The outgoing end of the codec 9 is connected to the input/output terminal 14. Music is outputted as analog data from this input/output terminal 14, or the D/A (digital analog) converter and the A/D (analogue to digital) converter are built in the codec 9 so that the music data of an analog may be inputted conversely and it may change into digital data. The graphic display is omitted although sound ROM for reproducing MIDI, DRAM for effects for processing a WAV file by echo processing etc., etc. are connected to DSP8.

[0028] If compression processing is carried out by MP3 etc., it will be sent to DSP8 via the signal wire 54, and, as for the music data which the system control part 7 received via the signal wire 52 when playing music, elongation processing will be performed. The music data by which elongation processing was carried out is sent to the codec 9 via the signal wire 58, and is outputted as a music signal of an analog from the input/output terminal 14. The music data which has not received compression processing is directly inputted into the codec 9 via the signal wire 56 from the system control part 7, and is outputted as a music signal of an analog from the input/output terminal 14.

[0029] The system control part 7 has the musical table 18. Two or more frequency patterns which function as an equalizer which adds change to the original frequency characteristic of the music data reproduced are stored in the musical table 18. Here, the example of a frequency pattern is explained using drawing 2. As for drawing 2 (a), the genre of music shows the frequency pattern of the "blues." The horizontal axis is indicating the frequency from 20 Hz of an auditory sensation area to 20 kHz by linear. The vertical axis is indicating the sound pressure level by the log. In this example, to the "blues", it is adjusted so that between low-pitched sound and inside sounds and between an inside sound and loud sounds may be relatively set to a sound pressure level lower than others. Similarly, drawing 2 (b) is a case where the genre of music is a "disco", and, as for drawing 2 (c), shows the frequency pattern in the case of "jazz."

[0030] In the musical table 18, a frequency pattern which is matched with the ID information described by the above-mentioned MP3 tag, for example by 1 to 1, and is different, respectively is stored. If reproduction of music data is started, a predetermined frequency pattern will be chosen from the musical table 18 by the system control part 7 based on the ID information for every music, and the music data of the music concerned will be processed. In DSP8 or the codec 9, musical processing based on a predetermined frequency pattern is performed based on control of the system control part 7.

[0031] Thus, in the music reproduction device by this embodiment. 1st I/O interface 3 that incorporates from PC1 the digital music data in which ID information accompanied, DSP8 which performs compression or elongation processing of music data, and 2nd I/O interface 4 that transmits the compressed music data to the

memory card 2, The musical table 18 which stored two or more frequency patterns memorized beforehand, It has DSP8 as a processing section or the codec 9 which chooses a predetermined frequency pattern from a musical table based on ID information, and processes music data, and the input/output terminal 14 which outputs the processed music data as analog data.

[0032]Thus, in the music reproduction device by this embodiment. Since it has the musical table which stored two or more frequency patterns memorized beforehand, a predetermined frequency pattern is chosen based on the ID information for every music and the music data of the music concerned is processed, even if the user itself does not operate it, a desired equalizer function can be used for every music.

[0033]The frequency pattern stored in the musical table 18 can be stored now in the musical table 18 from PC1 via 1st I/O interface 3. Namely, a user can create newly the frequency pattern stored in the musical table 18 on PC1, or it can edit the existing frequency pattern, and can store it now in the musical table 18. Since the obtained frequency pattern is stored in the musical table 18 from PC1 via 1st I/O interface 3, when using the music reproduction device 15, the necessity that a user does adjustment of an equalizer etc. directly to the music reproduction device 15 is not produced at all.

[0034]Next, the case where the analog sound easy data inputted into the input/output terminal 14 is recorded is explained briefly. First, after the music data inputted into the input/output terminal 14 is changed into digital data by the codec 9, when performing and recording a data compression, it is sent to DSP8 via the signal wire 58. After predetermined compression processing is performed to the music data sent to DSP8, it is sent to the system control part 7 through the signal wire 54. When recording as non compression data, data is outputted to the direct system control section 7 from the signal wire 56 without DSP8. The music data for record sent to the system control part 7 is outputted and recorded on PC1 or the memory card 2 by control of the system control part 7 via either of 1st or 2nd I/O interface 3 and 4.

[0035]The signal from the control switch 16 which the user of the music reproduction device 15 uses inputs into the system control part 7. The mechanical switch formed in the case exterior of the music reproduction device 15 may be sufficient as the control switch 16, and, specifically, it may be a remote controlled switch etc. which were formed in the middle of the cable of the headphone and earphone which were connected to the output terminal of the input/output terminal 14. It is possible to equip the control switch 16 with various switching functions if needed. For example, it may be made to send out the signal for changing the music data which changes ON and OFF of the power supply of the music reproduction device 15, changes a recording mode and reproduction mode, or is played, or performing sickle hocked leg \*\*\*\* to the system control part 7. Or the signal for changing the indicative data displayed on the already explained display for indication 6 may be sent out to the system control part 7. The system control part 7 controls each circuit to be in a desired state in response to the signal from the control switch 16. For example, when carrying out music reproduction, without using an equalizer function, based on directions of the user from the control switch 16, the system control part 7 changes the frequency pattern to be used to a flat frequency characteristic pattern compulsorily.

[0036]Next, the power supply of the music reproduction device 15 is explained. The rechargeable battery 11 for supplying electric power to each circuit in the music reproduction device 15 is built in the music reproduction device 15. A nickel hydoride battery, a lithium ion, etc. can be used as the rechargeable battery 11. The music reproduction device 15 contains the charge circuit 10 for charging the rechargeable battery 11. The charge circuit 10 is connected to the power source wire 60. The power source wire 60 is connected to the predetermined pin of the connector of 1st I/O interface 3. If the music reproduction device 15 is inserted in the PC Card slot which PC1 does not illustrate and 1st I/O interface 3 is connected to the PCMCIA-interface of PC1, The voltage of 5V or 3.3V is supplied to the predetermined pin of the connector of 1st I/O interface 3 from PC1 side. Therefore, if the music reproduction device 15 is connected to PC1, predetermined voltage can be impressed to the charge circuit 10 from PC1 side via the signal wire 60, and the rechargeable battery 11 can be charged based on it.

[0037]As opposed to each circuit, the voltage of 2.4V can be impressed from the rechargeable battery 11 side, charging the rechargeable battery 11. It is connected also to the booster circuit 12 and the voltage of the booster circuits 12-3.3V can impress now the outgoing end of the rechargeable battery 11 to each circuit. Thus, since supply of a power supply can be received from PC1 in the music reproduction device 15 by this embodiment, there is no consumption of the built-in rechargeable battery 11. When an external AC adapter (not shown) will need to be used, it is easy to be natural even if it forms the external AC adapter terminal 13, as the figure destructive line showed.



[0038]Next, the constructional example of the music reproduction device 15 by this embodiment is explained using drawing 3. Drawing 3 (a) is an exploded perspective view of the music reproduction device 15 constituted from Type II in the physical specification of a PC card based on the standard of PCMCIA. Drawing 3 (b) is an exploded perspective view showing the structure of CF as the memory card 2 used inserting in the music reproduction device 15 by this embodiment. The memory card (CF) 2 is provided with the following in drawing 3 (a) and (b).

Electronic parts 26 mounted on the substrate, such as a memory controller and a memory chip.

The connector 17 of 50 pins.

The metal panel 19 which forms rear surface both sides of a case.

Immobilization of the metal panel 19 will form the guide groove 38 which can insert the memory card 2 in the both side surfaces of the figure Nakaya seal direction of a case along with the guide formed with the frame 20 of the music reproduction device 15.

[0039]Two or more electronic parts 23 in which the music reproduction device 15 includes the system control part 7 explained by drawing 1 on the substrate 22, a charge circuit, etc. are mounted. The rechargeable battery 11 is also carried on the substrate 22. The connector which constitutes the physical layer interface of 1st I/O interface 3 is attached to the end surface of the substrate 22, and the connector which constitutes the physical layer interface of 2nd I/O interface 4 is attached to the other end face which counters.

[0040]The periphery of the substrate 22 with which these parts were mounted is inserted in the method of the inside of the fork part 39 of two of the frame 20, and the metal panel 21 which constitutes rear surface both sides of a case is put from the upper and lower sides of the frame 20, and it fixes. The space which can insert the memory card 2 comprises the two fork parts 39 of the frame 20, and a connector area by the side of 2nd I/O interface 4 of the substrate 22. If alignment of the guide groove of the memory card 2 and the guide of each method of the inside of a fork of the frame 20 is carried out and the memory card 2 is fitted over this space, the connector 17 and the connector area by the side of 2nd I/O interface 4 are connectable.

[0041]The input/output terminal 14 which can connect headphone, a microphone, etc., and the control switch 16 are formed in both the fork tip part of the frame 20. In both forks of the frame 20, metallic wiring insulated from the frame 20 is given, and the input/output terminal 14 and the control switch 16 are electrically connected with the prescribed circuit of the electronic parts 23 on the substrate 22 by this metallic wiring.

[0042]Next, operation of the music reproduction device 15 by this embodiment is explained using drawing 1 thru/or drawing 4. Drawing 4 is PC1, the music reproduction device 15, and a figure showing the state of extraction and insertion of the memory card 2. First, the music reproduction device 15 shown in drawing 4 is inserted in PC Card slot 31 of PC1, and operation in the state where the memory card 2 is inserted in the music reproduction device 15 is explained. For example, 1st I/O interface 3 was inputted from PC1, error detection/protocol processing of a data signal are performed, or it performs control for PC1 side to carry out device recognition of the music reproduction device 15. In order to realize the control procedure with which 1st I/O interface 3 passed 1st I/O interface 3 of the system control part 7 and PC1 at this time, the data sent out from the system control part 7 is changed into data suitable for the PCMCIA-interface by the side of PC1. 1st I/O interface 3 changes the data by which was sent out from PC1 and parallel conversion was carried out via the 1st input/output interface 3, and a command into the form which the system control part 7 can interpret, or performs processing changed into an electric interface suitable for the system control part 7.

[0043]For example, 2nd I/O interface 4 was inputted from the memory card 2, error detection/protocol processing of a data signal are performed, or it performs control for the memory card 2 side to carry out device recognition of the music reproduction device 15. In order to realize the control procedure with which 2nd I/O interface 4 passed 2nd I/O interface 4 of the system control part 7 and the memory card 2 at this time, the data sent out from the system control part 7 is changed into data suitable for the interface by the side of the memory card 2. 2nd I/O interface 4 changes the data sent out from the memory card 2, and a command into the form which the system control part 7 can interpret, or performs processing changed into an electric interface suitable for the system control part 7.

[0044]Thus, the music reproduction device 15 by this embodiment performs the same interface operation as the conventional PC card by inserting and connecting with the slot 31 of a PC card drive device provided in PC1. Although this embodiment explains to 1st I/O interface 3 taking the case of the case where it has PC card interface based on the standard of PCMCIA, Other already explained PC cards, for example, "Compact Flash", It is easy to be natural as the interface used for "Small PC Card", "Minituare Card", "SmartMedia",



“MultiMedia Card”, and a “memory stick” is given to 1st I/O interface 3. Furthermore, 1st I/O interface 3 is not restricted to PC card interface, The interface corresponding to a USB (Universal Serial Bus) standard may be used, or it is easy to be natural even if constituted from an interface corresponding to an IEEE1394 standard, etc.

[0045]Thus, after inserting the memory card 2 in the music reproduction device 15, if the music reproduction device 15 is inserted in PC Card slot 31 of PC1 and it electrically connects with it, the exchange of card recognition information will be performed via CPU of PC1, and the controller in the memory card 2. And via the predetermined power pin in the connector of PC1 to 1st I/O interface 3, voltage is impressed to the charge circuit 10, a power supply is supplied to the rechargeable battery 11 at the same time it checks connection of the memory card 2, and electric power is supplied to each circuit from the rechargeable battery 11.

[0046]Now, if the above interface operations are completed, the music data memorized by the magnetic disk drive built in PC1 will be taken out, The thing of the memory card 2 to do for solid MEMORIHE record becomes possible at this order via 1st I/O interface 3, the signal wire 50, and 2nd I/O interface 4.

[0047]It is possible to record on that magnetic disk drive that took out the music data in the memory card 2, and was conversely built in PC1 at this order via 2nd I/O interface 4, the signal wire 50, and 1st I/O interface 3. In the direct data transfer of these PC1 and memory cards 2, it is also possible to perform encryption processing using the system control part 7 to the music data transmitted. Although control at the time of transmitting music data between PC1 and the memory card 2 is performed by the system control part 7, the control by the system control part 7 is started by the directions from PC1, or the directions from the control switch 16.

[0048]Next, the case where music data is inputted and recorded from the input terminal of the input/output terminal 14 is explained. First, the inputted music data of an analog is changed into digital data by the codec 9. In DSP8 already explained performing a data compression and recording on the magnetic disk drive of PC1 if required, 1st I/O interface 3 is activated via the system control part 7, and it outputs music data to PC1 side. Also when recording on the memory card 2, if required, DSP8 will perform a data compression, 2nd I/O interface 4 is activated via the system control part 7, and music data is outputted to the memory card 2. The information on an “ID3 tag” etc. is not added to the music data inputted from the input/output terminal 14. Then, it is also possible to operate the control switch 16, to choose arbitrary patterns from the frequency pattern of a large number already stored in the musical table 18, and to add the information which shows the frequency pattern concerned to the music data recorded on the memory card 2.

[0049]Next, an earphone etc. are connected to the output terminal of the input/output terminal 14, and the case where music is played and listened to is explained. First, in order to reproduce the music data recorded on the magnetic disk drive in PC1, music data is inputted via 1st I/O interface 3. Through the signal wire 52, via the system control part 7, if the inputted music data is required, it will perform data decompression by DSP8 already explained, and will output it as music data of an analog by the codec 9. When reproducing the music data recorded on the memory card 2, it is also the same as that of \*\*\*\* except the point of inputting music data via 2nd I/O interface 4.

[0050]If the system control part 7 receives directions of a reproduction start of music data in the above operation, A predetermined frequency pattern is chosen from the musical table 18 based on the ID information of the music to reproduce, and it directs to process the music data of the music concerned by a predetermined frequency pattern to DSP8 or the codec 9. DSP8 or the codec 9 functions as an equalizer to a fundamental tone based on the specified frequency pattern. Thus, since a predetermined frequency pattern is chosen based on the ID information for every music and the music data of the music concerned is processed, even if the user itself does not do any operation, an equalizer function comes to commit him automatically.

[0051]Next, the procedure of storing a desired frequency pattern in the musical table 18 using PC1 is explained. A user can create newly the frequency pattern stored in the musical table 18 on PC1, or it can edit the existing frequency pattern, and can store it now in the musical table 18. Therefore, double with the atmosphere of the genre of music, amend change of the tone quality depending on the arrangement place of the reproduction loudspeaker, change the textures of music by a user's original liking, or further, The new production of a frequency pattern or edit which amends the variation in a reproduced sound peculiar to playback equipment can be easily obtained using a simulation etc. on PC1. The obtained frequency pattern is stored in the musical table 18 from PC1 via 1st I/O interface 3.

[0052]The system control part 7 performs control which changes the record/reproduction mode from a user

through the control switch 16, or changes whether the medium of record/playback is used as the magnetic disk of PC1, or the memory card 2 is used. The system control part 7 controls the display-for-indication control section 5, and displays information suitably required for the display for indication 6 according to the directions from the control switch 16. In the midst of the above operation, voltage is impressed to the charge circuit 10 via 1st I/O interface 3 from PC1 side, and the rechargeable battery 11 supplies electric power to each circuit in the music reproduction device 15, charging.

[0053]Next, in drawing 4, the music reproduction device 15 is drawn out from PC Card slot 31 of PC1, and the memory card 2 explains the case where the music reproduction device 15 is operated in the state where it is inserted in the music reproduction device 15. First, an input of the instructions which make one the power supply of the music reproduction device 15 when a user operates the control switch 16 will supply electric power to each circuit from the rechargeable battery 11. At this time, control by the system control part 7 is performed so that 1st I/O interface 3 may suspend a function substantially. On the other hand, 2nd I/O interface 4 is the same operation as \*\*\*, performs error detection/protocol processings, such as a data signal from the memory card 2, or performs control for the music reproduction device 15 side to carry out device recognition of the memory card 2.

[0054]When reproducing the music data which connects an earphone etc. to the output terminal of the input/output terminal 14, and is recorded on the memory card 2, Via [ 2nd I/O interface 4 the signal wire 52 and the system control part 7 ] and, if required, data decompression by DSP8 will also be performed and analog sound easy data will be outputted via the codec 9.

[0055]When inputting and recording music data from the input terminal of the input/output terminal 14, the inputted music data of an analog is changed into digital data by the codec 9. If required, DSP8 will perform a data compression, 2nd I/O interface 4 is activated via the system control part 7, and music data is outputted to the memory card 2.

[0056]In the above operation, if reproduction of music data is started, the system control part 7, The data of the selected frequency pattern is outputted to DSP8 or the codec 9 so that a predetermined frequency pattern may be chosen from the musical table 18 based on the ID information for every music and the music data of the music concerned may be processed. Also in this case, a predetermined frequency pattern is chosen based on the ID information for every music, the music data of the music concerned is processed, and by \*\*, even if the user itself does not do any operation, he can use a desired equalizer function for every music.

[0057]In the above operation, the system control part 7 performs control for changing the record/reproduction mode from a user through the control switch 16, or changing record/reproduction medium to another memory card 2. The system control part 7 controls the display-for-indication control section 5, and displays information suitably required for the display for indication 6 according to the directions from the control switch 16. While the above operation is performed, electric power continues being supplied from the rechargeable battery 11 to each circuit. According to the music reproduction device 15 by this embodiment, two or more music data can be substituted and heard by substituting the memory card 2.

[0058]Not only the above-mentioned embodiment but various modification is possible for this invention. For example, in the above-mentioned embodiment, although the example which records music data on the memory card 2 using 2nd I/O interface 4 was shown, this invention is not restricted to this. For example, it may be made to build in another memory storage in the music reproduction device 15. In this case, the memory storage which memorizes music etc. may be formed only in the music reproduction device 15, without [ that is, ] establishing 2nd I/O interface 4, and it may be made to use together with the external memory card 2 with 2nd I/O interface 4. Even when the music reproduction device 15 is drawn out from PC1 and there is no memory card 2, it comes to be able to perform musical record/playback by making such memory storage build in.

[0059]Although fixed in the music reproduction device 15, this invention is not restricted to this but it may be made for the rechargeable battery 11 to carry the rechargeable battery 11 dismountable in the above-mentioned embodiment. If the rechargeable battery 11 is made dismountable, the spare rechargeable battery 11 can be made to charge using an external AC adapter and battery charger. It is also possible to use a dry cell instead of the rechargeable battery 11. However, in order to use together the rechargeable battery 11 and a dry cell, when a dry cell is used, it is desirable to form the mechanism in which the charging function of the charge circuit 10 is stopped.

[0060]The above-mentioned embodiment explained taking the case of the data compression system by MP3.

Therefore, when choosing the frequency pattern in the musical table 18, the ID information of ID tag 3 in an MP3 data file is used, but it is also possible for this invention not to be restricted to this, of course, but to use the ID information in another data file form.

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[Translation done.]

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- 3.In the drawings, any words are not translated.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1]It is a system block figure showing the composition of the outline of the music reproduction device by the 1 embodiment of this invention.

[Drawing 2]It is a figure showing the example of the frequency pattern used with the music reproduction device by the 1 embodiment of this invention.

[Drawing 3]It is a figure explaining the structure of the outline of the music reproduction device by the 1 embodiment of this invention.

[Drawing 4]It is a figure explaining the directions for the music reproduction device by the 1 embodiment of this invention.

[Description of Notations]

- 1 PC
- 2 Memory card (CF)
- 3 The 1st I/O interface
- 4 The 2nd I/O interface
- 5 Display-for-indication control section
- 6 Display for indication
- 7 System control part
- 8 DSP
- 9 Codec
- 10 Charge circuit
- 11 Rechargeable battery
- 12 Booster circuit
- 13 External AC adapter terminal
- 14 Input/output terminal
- 15 Music reproduction device
- 16 Control switch
- 17 Connector
- 18 Musical table
- 19, 21 metal panels
- 20 Frame
- 22 Substrate
- 23 Electronic parts
- 38 Guide groove
- 39 Fork part
- 50, 52, 54, 56, and 58 Signal wire
- 60 Power source wire

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[Translation done.]



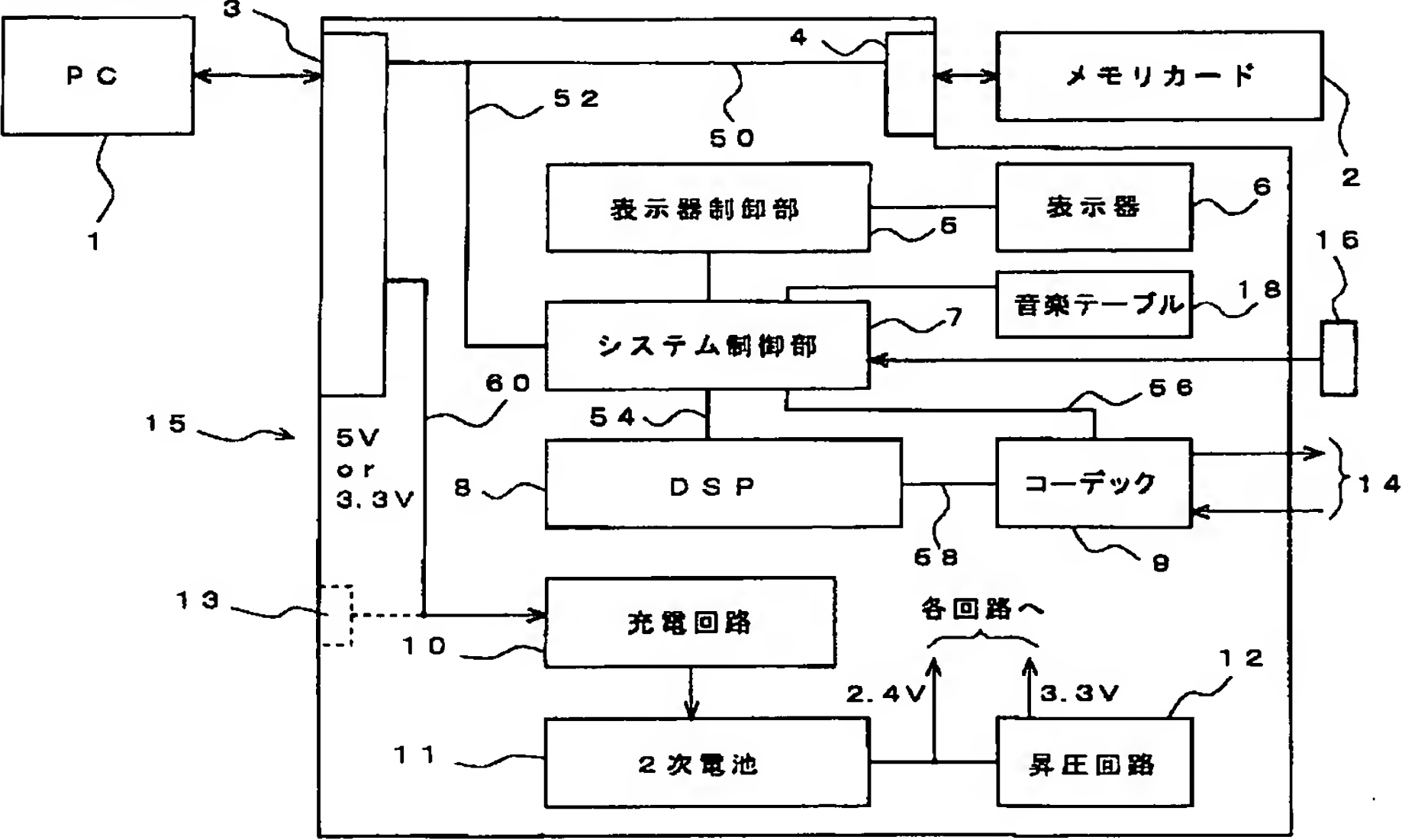
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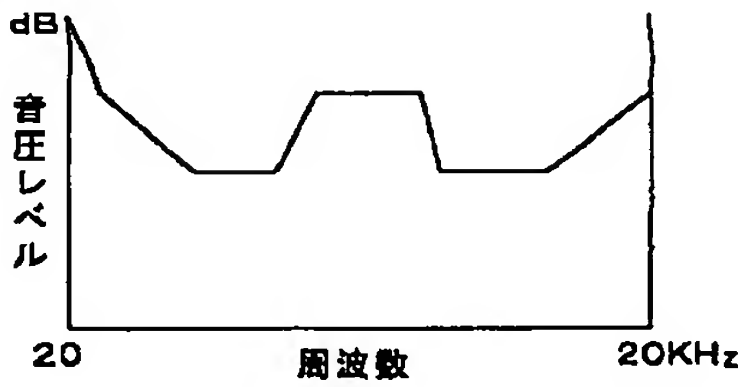
DRAWINGS

[Drawing 1]

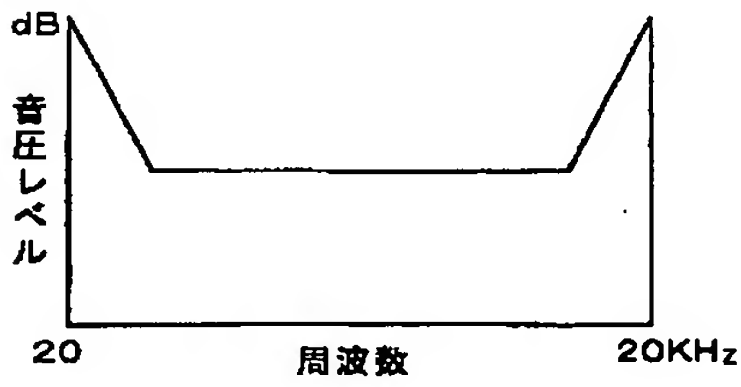


[Drawing 2]

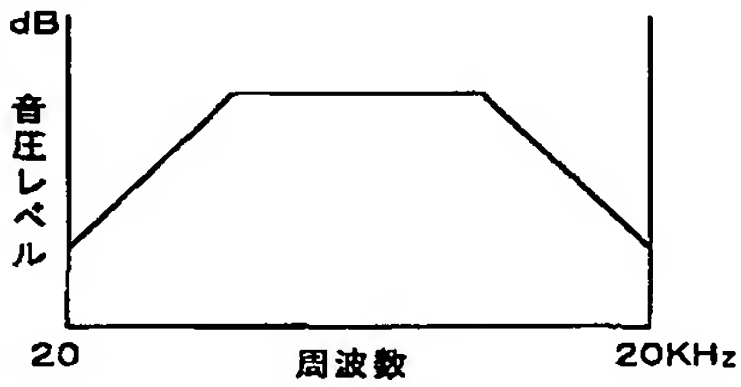
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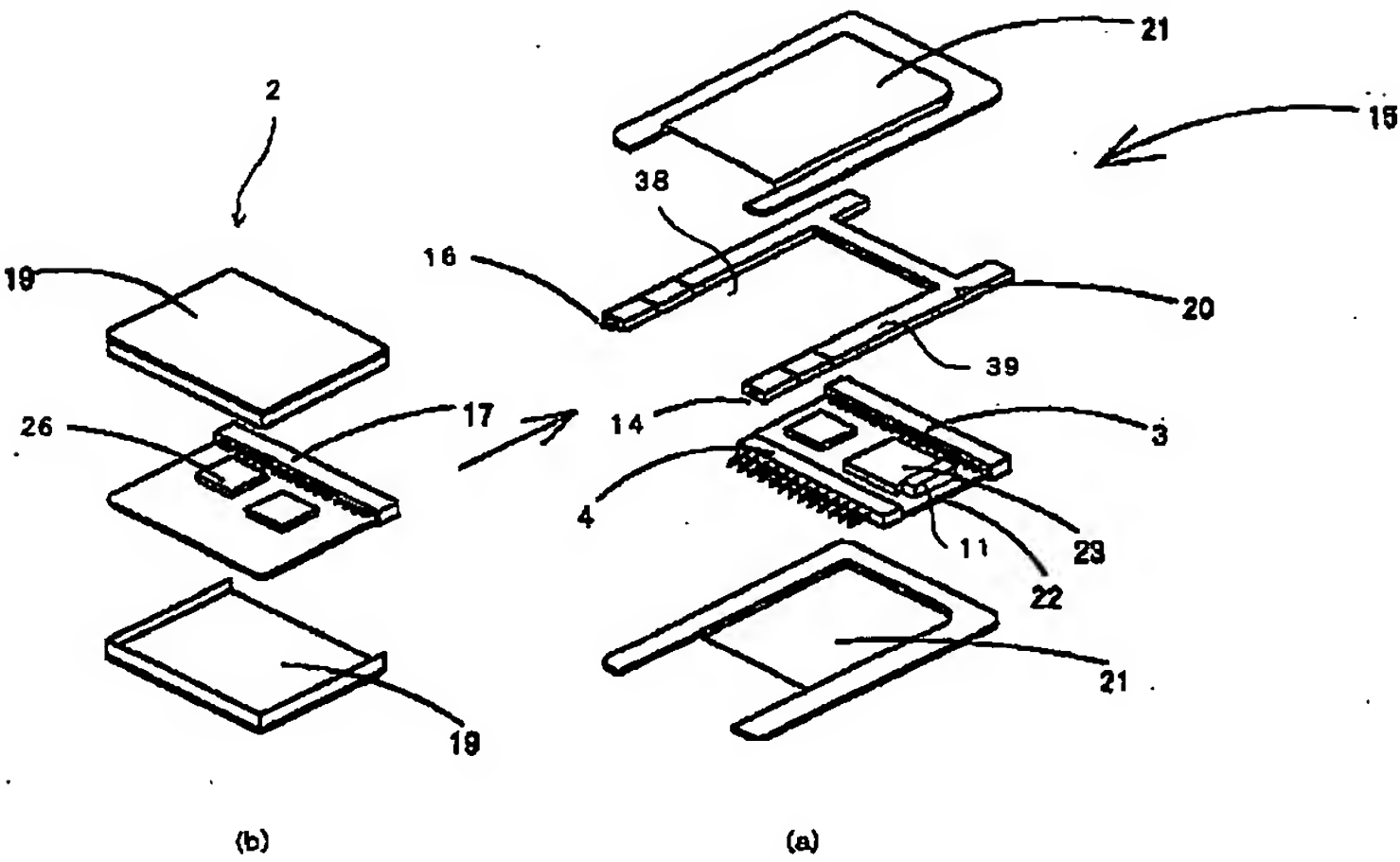
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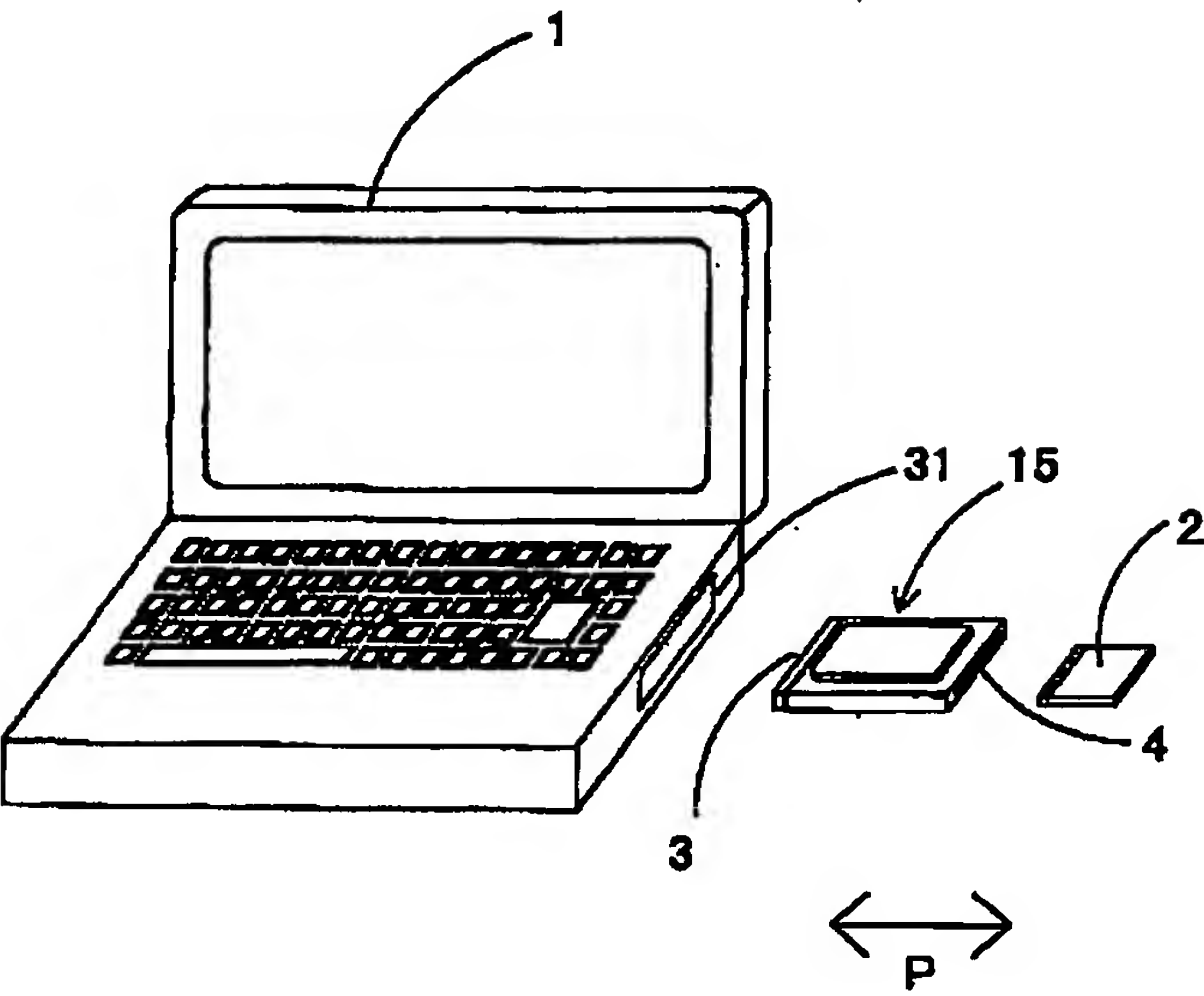
(c) ジャズ



[Drawing 3]



[Drawing 4]



[Translation done.]

## PATENT ABSTRACTS OF JAPAN

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(71)Applicant : KENWOOD CORP

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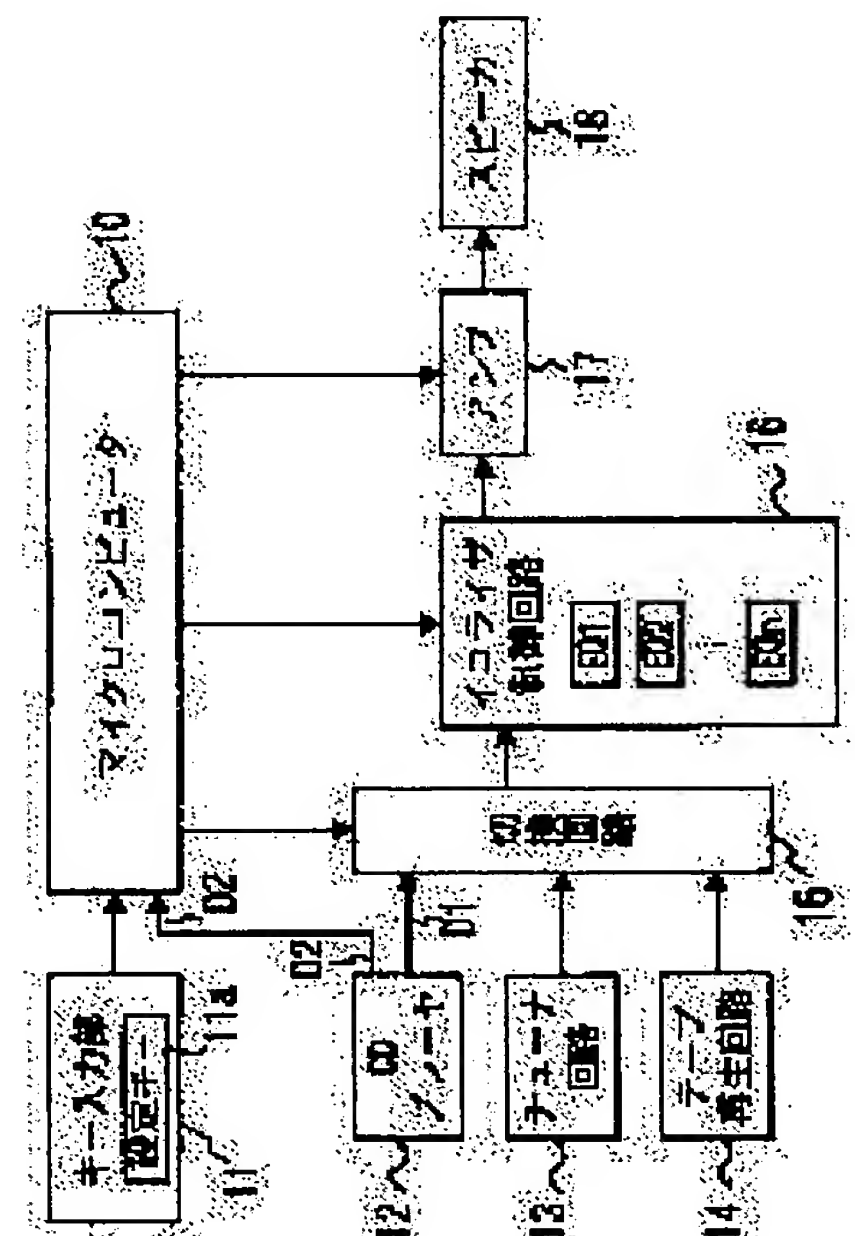
(72)Inventor : ARAI SHIGEKO

## (54) CD REPRODUCING DEVICE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a CD reproducing device capable of performing the correcting of an equalizer automatically in accordance with genres of pieces of music of a played CD.

**SOLUTION:** This reproducing device is constituted so that operation commanding signals from a key input part 11 are supplied to a microcomputer 10 for compositely controlling the whole of the player. Then, the reproducing device has three systems of sound sources of a CD player 12, a tuner circuit 13 and a tape reproducing circuit 14 and outputs of these systems are inputted to a changeover circuit 15. In the poststage of the circuit 15, an equalizer control circuit 16 and an amplifier 17 are successively connected and a speaker 18 is connected to the output end of the amplifier 17. The equalizer control circuit 16 performs the correcting of the frequency characteristic of an equalizer automatically based on the data of selected equalizer characteristics EQ1 to EQn taken out from the inside of a memory in which data of plural equalizer characteristics Q1 to Qn which are preset are stored.





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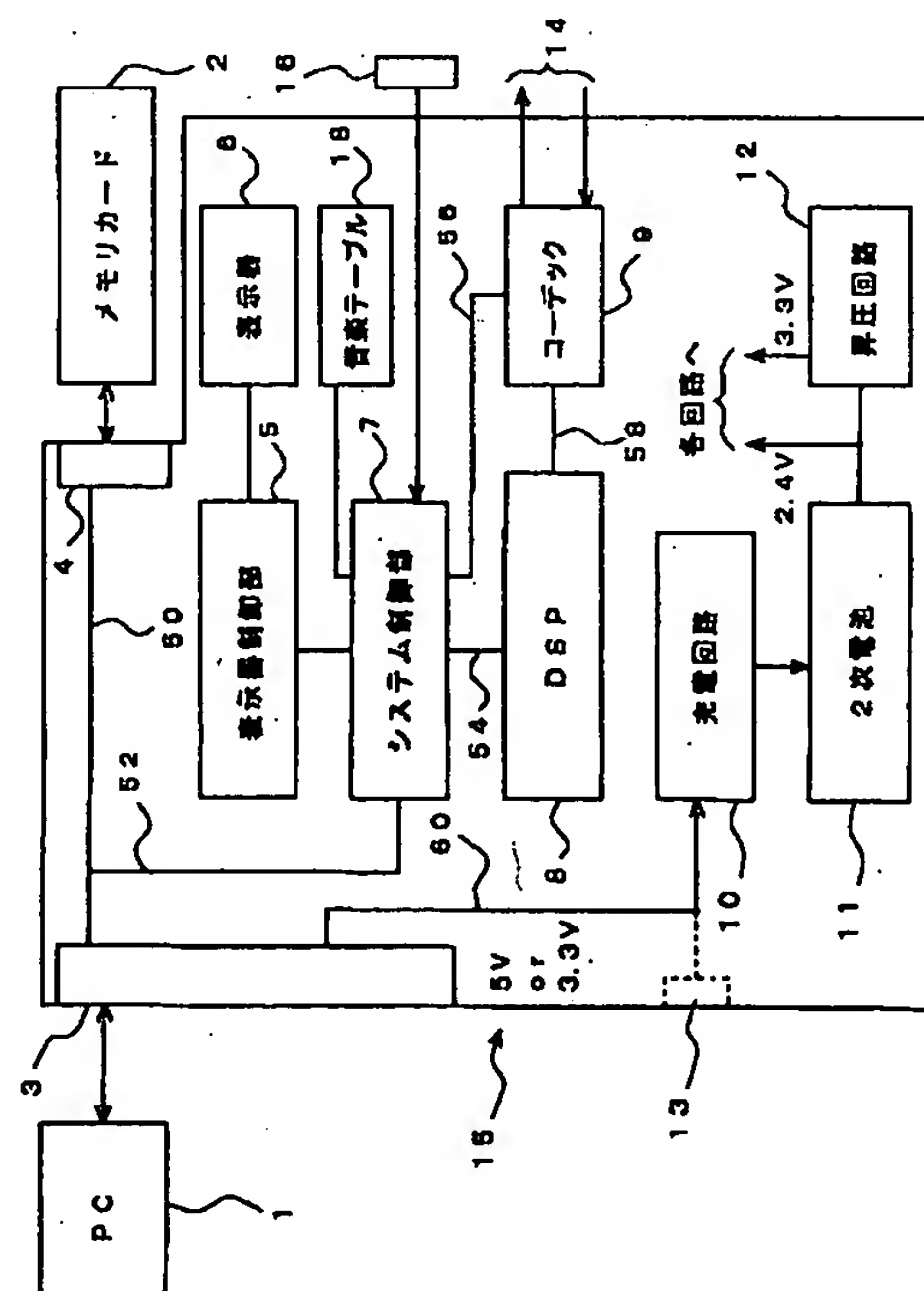
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(54) 【発明の名称】 音楽再生装置

(57) 【要約】

【課題】本発明は、音楽データが記憶された情報記憶装置から音楽を再生する音楽再生装置に関し、ユーザ自身が操作しなくても曲毎に所望のイコライザー機能が働く音楽再生装置を提供することを目的とする。

【解決手段】ID情報が付随したデジタルの音楽データをPC1から取り込む第1の入出力インターフェース3と、音楽データの圧縮又は伸長処理を行うDSP8と、圧縮された音楽データをメモ리카ード2へ転送する第2の入出力インターフェース4と、予め記憶した複数の周波数パターンを格納した音楽テーブル18と、ID情報に基づいて音楽テーブルから所定の周波数パターンを選択して音楽データを加工する加工部としてのDSP8又はコーデック9と、加工された音楽データをアナログデータとして出力する入出力端子14とを有するように構成する。



## 【特許請求の範囲】

【請求項1】ID情報が付随したデジタルの音楽データを情報処理装置から取り込む第1の入出力インターフェースと、

前記音楽データの圧縮又は伸長処理を行う圧縮／伸長処理部と、

圧縮された前記音楽データを記録媒体へ転送する第2の入出力インターフェースと、

予め記憶した複数の周波数パターンを格納した音楽テーブルと、

前記ID情報に基づいて前記音楽テーブルから所定の前記周波数パターンを選択して前記音楽データを加工する加工部と、

加工された前記音楽データをアナログデータに変換して出力する出力部とを有することを特徴する音楽再生装置。

【請求項2】請求項1記載の音楽再生装置であって、前記周波数パターンは、前記第1の入出力インターフェースを介して前記情報処理装置から前記音楽テーブルに格納されることを特徴とする音楽再生装置。

【請求項3】請求項1又は2に記載の音楽再生装置であって、

前記記録媒体は固体メモリで構成されていることを特徴とする音楽再生装置。

【請求項4】請求項3記載の音楽再生装置であって、前記記録媒体は前記第2の入出力インターフェースから抜き差し可能に設けられていることを特徴とする音楽再生装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、音声や音楽等のデータ（以下、音楽データという）が記憶された情報記憶装置から音楽を再生する音楽再生装置に関する。

## 【0002】

【従来の技術】音楽データを記録／再生する情報記録／再生装置の情報記録媒体として、一般に磁気テープあるいは、読み書き可能な光磁気ディスク、コンパクトディスク、またはミニディスク（以下、MDと総称する）等が用いられているが、近年の半導体集積技術の向上に伴い、大容量で小型の書き換え可能なフラッシュメモリ等の半導体記憶装置（固体メモリ）が音楽データの記録媒体として注目を集めている。それに伴い半導体記憶装置を記録媒体として本体に内蔵した音楽再生装置（携帯型オーディオ再生装置）が登場してきている。この再生装置は、カセットテープやMDのような回転させて情報を転送する記録媒体を用いないので、回転機構系を設ける必要がないだけ振動にも強い。特にMD等は振動による音飛びの問題を有しており、装置内に音飛び防止用のバッファを設ける必要が生じているが、上記の再生装置ではその必要もないので装置構成を簡単にすることがで

き、コスト面でも利点を有している。

【0003】ところで、情報処理装置（例えば、パーソナル・コンピュータ、以下PCと略称する）に内蔵された磁気ディスク装置（以下、HDDという）に音楽データを記憶させ、音楽再生ソフトウェアを用いてPCに接続されたスピーカあるいはイヤホンジャックから音楽を再生して聴くことができるようになっている。音楽データは、WAV（ADPCM方式：アナログ・デジタル・パルス・コード・モジュレーション方式）ファイルとして記憶すると、例えば1分間の音楽で10MB程度の記憶容量が必要となる。そこで、例えばISO（国際標準化機構）が定めたオーディオ圧縮技術の国際標準方式であるMP3（MPEG1 Audio Layer 3）等を用いて1MB／1分程度に音楽データを圧縮してHDDに記憶させるようにしている。

【0004】このオーディオ圧縮技術を用いると、高品質を維持しながら音楽データの記憶容量を1／10程度に小さくできるため、最近では、フラッシュメモリ等を内蔵した上述の携帯型オーディオ再生装置にPCのHDDに蓄えられたMP3の音楽データを転送して記憶させ、屋外などで再生して聴くことができるようになってきている。

【0005】この携帯型オーディオ再生装置を利用するには、MP3の音楽データをHDDに蓄積したPCが必須である。PCとオーディオ再生装置とはパラレル・インターフェース（I／F）、シリアルI／F、あるいはPCMCIA（Personal Computer Memory Card International Association）規格に準拠したPCカードI／F等により接続され、PC上で起動した転送ソフトウェアを用いてHDDに記憶されたMP3の音楽データを再生装置側のフラッシュメモリ等に転送するようになっている。

## 【0006】

【発明が解決しようとする課題】ところで一般に、再生データが原音を忠実に再現して高品質であるほど再生装置のイコライザー機能が重視される。イコライザー機能は、音楽データの再生時に音楽データの元の周波数を変更することができる機能であり、曲のジャンル（例えば、ジャズ、ブルースなど）の雰囲気にも合うように原音の周波数を変更したり、車載用オーディオ再生装置等における再生スピーカの配置場所に依存した音質の変化を補正したり、あるいは、ユーザ独自の好みで曲の質感を変更したり、さらには、再生装置固有の再生音のバラツキを補正したりするために用いることができる。

【0007】ところが現状の携帯型オーディオ再生装置には、イコライザー機能が設けられていないか、設けられているとしても低音域から高音域までを数段階に分けてレベル調整する程度の機能しか有していない。これは、携帯性を重視するために再生装置筐体や装置に付随

するリモコンの筐体はできるだけ小型にする必要があり、これら小型の筐体に十分な機能を備えたイコライザーを配置するのが困難であると共に、通常のユーザが屋外等でイコライザーを操作して曲毎に正確に音質を合わせたり、音質を補正したりするのは現実には困難であり、結局あまり利用されないことが一因であると考えられる。車載用オーディオ再生装置の場合にも、運転中にイコライザーを操作するのは危険でもあり結局利用されない場合が多いと考えられる。しかしながら、一方で、上述のイコライザー機能を十分活用した優れた音質の音楽を屋外にいても聴きたいというユーザの欲求は強い。

【0008】本発明の目的は、ユーザ自身が操作しなくても曲毎に所望のイコライザー機能が働く音楽再生装置を提供することにある。

【0009】

【課題を解決するための手段】上記目的は、ID情報が付随したデジタルの音楽データを情報処理装置から取り込む第1の入出力インターフェースと、前記音楽データの圧縮又は伸長処理を行う圧縮／伸長処理部と、圧縮された前記音楽データを記録媒体へ転送する第2の入出力インターフェースと、予め記憶した複数の周波数パターンを格納した音楽テーブルと、前記ID情報に基づいて前記音楽テーブルから所定の前記周波数パターンを選択して前記音楽データを加工する加工部と、加工された前記音楽データをアナログデータに変換して出力する出力部とを有することを特徴する音楽再生装置によって達成される。

【0010】本発明は、予め記憶した複数の周波数パターンを格納した音楽テーブルを有しており、曲毎のID情報に基づいて所定の周波数パターンが選択されて当該曲の音楽データを加工するので、ユーザ自身が操作しなくても曲毎に所望のイコライザー機能を働かせることができる。

【0011】上記本発明の音楽再生装置であって、前記周波数パターンは、前記第1の入出力インターフェースを介して前記情報処理装置から前記音楽テーブルに格納されることを特徴とする。

【0012】このように本発明によれば、音楽再生装置内の音楽テーブルに記憶される周波数パターンは、情報処理装置上でユーザが新規に作成し、あるいは既存の周波数パターンを編集して音楽テーブル内に格納することができる。

【0013】また、前記記録媒体は固体メモリで構成されていることを特徴とする。さらに、前記記録媒体は前記第2の入出力インターフェースから抜き差し可能に設けられていることを特徴とする。固体メモリを抜き差し可能に用いることにより、屋外でも複数の音楽を聴くことができるようになる。

【0014】

【発明の実施の形態】本発明の一実施の形態による音楽

再生装置を図1及び図4を用いて説明する。本実施の形態による音楽再生装置はPCカードとして実現されているので、最初にPCカードの概略について説明する。PCカードは、音声や音楽、あるいは文字や画像情報等の種々の情報を処理するPCを初めとして民生用オーディオ機器やデジタル・スチル・カメラ等の情報処理装置に着脱可能に装着されて使用され、情報処理装置が行う種々の処理の処理能力の向上や処理機能の拡張のために使われている。

【0015】PCカードは、当初、PC用のメモ리카ードの規格を作成するために設けられた団体であるPCMCIA(Personal Computer Memory Card International Association)が発表した統一規格(PC Card Standard)に基づいて国際標準化されている。PCカードは、主として携帯可能な小型PCに利用されている。PCMCIAの規格に基づくPCカードの物理的仕様(外觀形状)は、長さが85.6mm、幅が54.0mmのカード型であり、厚さの相違によりタイプI、タイプII、タイプIIIに区分されている。PCカードのコネクタには68ピンを有するツーピースコネクタが採用されている。PCカードは、携帯可能なPC等に設けられたPCカードインターフェースのPCカードスロットに当該コネクタを差し込んで使用され、使用しない場合にはPCカードスロットから引き抜くことができるようになっている。

【0016】このようにPCカードは容易に着脱できて小型で携帯性に優れているため、その用途は補助記憶装置としての半導体メモ리카ードだけでなく、磁気ディスク等のハードディスク装置を備えた補助記憶装置、あるいはモデム機能やLAN(Local Area Network)機能等の通信、ネットワーク関連分野、さらには音楽観賞用のミュージックカードとしても広がってきている。さらに、PCカードが使用される適用分野も拡大しつつあり、携帯型の小型PCに限られず、例えばデジタル・オーディオ機器やデジタル・スチル・カメラ等の音楽、画像情報処理装置に用いられて、着脱可能で携帯性に優れた音楽、画像記憶装置として、あるいはカメラに記憶した画像をPC等に転送するためのデータ転送装置としても使用されるようになってきている。

【0017】また従来、情報処理装置に対して所望の処理能力や処理機能を与えるには、拡張バス・スロットに所定の機能を有する基板を取り付けたり、PCのマザーボードに接続する内蔵基板モジュールを取り付けたりしなければならず、基板の差し替えや携帯性に困難を伴っていたのに対し、PCカードであれば、PCカードスロットに差し込むPCカードを交換するだけで即座に所望の処理能力、機能を得ることができるという取り扱いの容易さを有している。なお、情報処理装置に対するPCカードの着脱は、差し込んで引き抜く方式や置いて固定



したりする方式等がある。

【0018】近年、半導体素子の高集積化技術の発展と共に、より小型化されたPC、あるいはデジタル・スチル・カメラ、デジタル・ビデオ・カメラ、あるいは携帯型オーディオ機器等の民生用機器も含めた情報処理装置が開発され、PCへの利用を意図したPCMCIAの規格に基づく従来のPCカードに加えて、より小型化されたPCカードの出現が要望されるに至った。このため現在以下のような小型カードの規格が提唱され現実に製品として市場に登場している。

【0019】まず第1にCFA (Compact Flash Association) が提唱する「Compact Flash (サンディスク社の登録商標)」であり、これは外形寸法が36.4 (mm) × 42.8 (mm) × 3.3 (mm) の小型フラッシュメモリカードである。第2に松下電池工業(株)、(社)日本電子工業振興協会 (JEIDA: Japan Electronic Industry Development Association)、PCMCIAが提唱する「Small PC Card」であり、これは外形寸法が45.0 (mm) × 42.8 (mm) × 5.0 (mm) で、長さが従来のPCカードの約半分の大きさである。第3は、Miniature Card Implementers Forum、PCMCIAによる「Miniature Card」であり、これは外形寸法が38 (mm) × 33 (mm) × 3.5 (mm) の小型カードである。

【0020】第4には、SSFDC Forumの「SmartMedia ((株) 東芝の登録商標)」であり、これは外形寸法が37 (mm) × 45 (mm) × 0.67 (mm) で例えば2MB~16MB程度の容量のフラッシュEEPROMカードである。第5は、MultiMedia Card Associationの提唱する「MMC (MultiMedia Card)」であり、これは外形寸法が24 (mm) × 32 (mm) × 1.4 (mm) で例えば10MB程度の容量のフラッシュEEPROMカードである。第6には、ソニー株式会社が提唱する「メモリースティック (ソニー(株)の商標)」であり、これは外形寸法が21.5 (mm) × 50 (mm) × 2.8 (mm) で例えば8MB程度の容量のフラッシュEEPROMカードである。その他、磁気記録によるハードディスク・ドライブを備えた小型PCカードも開発されている。本願においては、以上説明した機能を有する小型カード、さらに、これらに類するカードを含めてPCカードと総称する。また、PCのインターフェースとしては、シリアル、パラレル、USB、IEEE1394等を用いることができる。

【0021】本実施の形態では、PCMCIAの規格に基づいたPCカードの音楽再生装置を例にとって説明す

る。図1は、平面方向から見た音楽再生装置15内部の概略構成を複数のブロックで示している。図1に示すように、音楽再生装置15は、情報処理装置としての例えばPC1との間でデジタルデータの転送を行う第1の入出力インターフェース3を有している。PC1は、図示を省略したが、PCカードインターフェース及びPCカードスロットを有している。第1の入出力インターフェース3は、PC1のPCカードインターフェースと物理的に接続するPCカード物理層インターフェースとして68ピンのツーピースコネクタを有している。

【0022】音楽再生装置15は、外部の情報記録媒体との間でデジタルデータの転送を行う第2の入出力インターフェース4を有している。外部の情報記録媒体としては、各種のメモリカード2、例えば、上述の「Compact Flash (以下、CFという)」や「SmartMedia」等を用いることができる。本実施の形態においては、物理層インターフェースとして50ピンコネクタを有するCFをメモリカード2に用いた場合で説明する。従って、第2の入出力インターフェース4は、メモリカード(CF)2を物理的に接続する50ピンのコネクタからなる物理層インターフェースを有している。

【0023】第1及び第2の入出力インターフェース3、4間には信号線50が接続されている。ここで、信号線50は複数の信号線の集合体を示しており、図1では便宜上1本の実線で示している。これ以降に説明する他の信号線の図示も同様である。この信号線50の少なくとも一部は分岐して、信号線52としてシステム制御部7に接続されている。システム制御部7は、信号線52を介して第1及び第2の入出力インターフェース3、4を制御するようになっている。また、システム制御部7は、第1の入出力インターフェース3を介してPC1との間でデータを送受したり、第2の入出力インターフェース4を介してメモリカード2との間でデータを送受することができるようになっている。さらに、システム制御部7の制御により、信号線50を介して第1及び第2の入出力インターフェース3、4を直結してPC1とメモリカード2との間で直接データの送受を行うようにすることもできるようになっている。

【0024】このように信号線50、52は、PC1、メモリカード2、及びシステム制御部7との間で転送されるべきデータ信号あるいはアドレス信号が流れるデータ/アドレス・バスラインとして用いられている。また、信号線52は、第1及び第2の入出力インターフェース3、4を制御するための制御信号が伝送される制御信号線も有している。システム制御部7は、第1及び第2の入出力インターフェース3、4の制御の他、音楽再生装置15内の各回路に対する制御も行うようになっている。

【0025】音楽再生装置15は、例えば液晶表示装置



からなる表示器6を有している。表示器6は、表示器制御部5と電氣的に接続され、再生している音楽の曲名、曲の再生時間、電池の残量等を表示することができるようになっている。これらの表示データのうち少なくとも曲名は、第1または第2の入出力インターフェース3、4を介してPC1またはメモ리카ード2から読み出される音楽データに含まれている。例えば、音楽データがMP3フォーマットで記録されている場合には、データファイルに「ID3タグ」と呼ぶ情報が書き込まれている。ID3タグには、演奏家の名前や曲名の他に、0～147の148個に分類された曲のジャンルを示すインデックスバイト（以下、ID情報という）が格納されている。システム制御部7は、読み出した音楽データからこれらの表示データを表示器制御部5に送る。表示器制御部5は送られてきた表示データが表示器6上で所定の表示がなされるように液晶表示装置を制御する。

【0026】また、音楽再生装置15はオーディオ用DSP8とコーデック9とを有している。オーディオ用DSP8は信号線54によりシステム制御部7から制御されるようになっている。また、コーデック9は信号線56によりシステム制御部7から制御されるようになっている。DSP8とコーデック9との間は信号線58で接続されている。これら信号線54、56、58は、システム制御部7とDSP8、コーデック9との間で音楽データ信号あるいはアドレス信号を送受するデータ/アドレス・バスラインを有している。

【0027】コーデック9の出力端は入出力端子14に接続されている。この入出力端子14からアナログデータとして音楽を出力したり、逆にアナログの音楽データを入力してデジタルデータに変換するように、コーデック9には、D/A（デジタル→アナログ）コンバータとA/D（アナログ→デジタル）コンバータが内蔵されている。なお、DSP8には、MIDIを再生するためのサウンドROMや、エコー処理などでWAVファイルを加工するためのエフェクト用DRAM等が接続されているが図示は省略している。

【0028】音楽を再生する際にシステム制御部7が信号線52を介して受け取った音楽データは、MP3等により圧縮処理がされていれば信号線54を介してDSP8に送られて伸長処理が行われる。伸長処理された音楽データは、信号線58を介してコーデック9に送られて入出力端子14からアナログの音楽信号として出力される。圧縮処理を受けていない音楽データは、システム制御部7から信号線56を介して直接コーデック9に入力され、入出力端子14からアナログの音楽信号として出力される。

【0029】また、システム制御部7は音楽テーブル18を有している。音楽テーブル18には、再生される音楽データの元の周波数特性に変更を加えるイコライザとして機能する複数の周波数パターンが格納されてい

る。ここで、周波数パターンの例について図2を用いて説明する。図2(a)は、曲のジャンルが「ブルース」の周波数パターンを示している。横軸は、可聴範囲の20Hzから20kHzまでの周波数をリニア表示している。縦軸は、音圧レベルをログ表示している。この例では、「ブルース」に対して、低音と中音の間、及び中音と高音の間が相対的に他より低い音圧レベルになるように調整されている。同様にして図2(b)は曲のジャンルが「ディスコ」の場合であり、図2(c)は「ジャズ」の場合の周波数パターンを示している。

【0030】音楽テーブル18内には、例えば上記のMP3タグに記述されたID情報に1対1に対応付けられてそれぞれ異なる周波数パターンが格納されている。音楽データの再生が開始されると、曲毎のID情報に基づいてシステム制御部7により音楽テーブル18から所定の周波数パターンが選択されて当該曲の音楽データを加工するようになっている。所定の周波数パターンに基づく音楽の加工は、システム制御部7の制御に基づき、DSP8あるいはコーデック9において行われる。

【0031】このように本実施の形態による音楽再生装置では、ID情報が付随したデジタルの音楽データをPC1から取り込む第1の入出力インターフェース3と、音楽データの圧縮又は伸長処理を行うDSP8と、圧縮された音楽データをメモ리카ード2へ転送する第2の入出力インターフェース4と、予め記憶した複数の周波数パターンを格納した音楽テーブル18と、ID情報に基づいて音楽テーブルから所定の周波数パターンを選択して音楽データを加工する加工部としてのDSP8又はコーデック9と、加工された音楽データをアナログデータとして出力する入出力端子14とを有している。

【0032】このように本実施の形態による音楽再生装置では、予め記憶した複数の周波数パターンを格納した音楽テーブルを有しており、曲毎のID情報に基づいて所定の周波数パターンが選択されて当該曲の音楽データを加工するので、ユーザ自身が操作しなくても曲毎に所望のイコライザ機能を働かせることができる。

【0033】また、音楽テーブル18に格納される周波数パターンは、第1の入出力インターフェース3を介してPC1から音楽テーブル18に格納することができるようになっている。すなわち、音楽テーブル18に格納される周波数パターンは、PC1上でユーザが新規に作成し、あるいは既存の周波数パターンを編集して音楽テーブル18内に格納することができるようになっている。得られた周波数パターンは第1の入出力インターフェース3を介してPC1から音楽テーブル18に格納されるので、音楽再生装置15を使用する際、ユーザが音楽再生装置15に対して直接的にイコライザの調整などをする必要は全く生じない。

【0034】次に、入出力端子14に入力するアナログ音楽データを記録する場合について簡単に説明する。ま

ず、入出力端子14に入力した音楽データは、コーデック9でデジタルデータに変換された後、データ圧縮を施して記録する場合には信号線58を介してDSP8に送られる。DSP8に送られた音楽データは、所定の圧縮処理を施された後、信号線54を通してシステム制御部7に送られる。非圧縮データとして記録する場合には、DSP8を介さず信号線56から直接システム制御部7にデータが出力される。システム制御部7に送られた記録用の音楽データは、システム制御部7の制御により、第1または第2の入出力インターフェース3、4のいずれかを介してPC1またはメモリカード2に出力されて記録される。

【0035】システム制御部7には、音楽再生装置15のユーザが利用する制御スイッチ16からの信号が入力するようになっている。制御スイッチ16は、具体的には、音楽再生装置15の筐体外部に設けられた機械的なスイッチでもよいし、入出力端子14の出力端子に接続されたヘッドホンやイヤホンのケーブル途中に設けたりリモコンスイッチ等であってもよい。制御スイッチ16には必要に応じて種々のスイッチング機能を備えることが可能である。例えば、音楽再生装置15の電源のオン/オフを切り替えたり、記録モードと再生モードとを切り替えたり、再生する音楽データを切り替えたり、あるいは曲飛ばしを行ったりするための信号をシステム制御部7に送出するようにしてもよい。あるいは、既に説明した表示器6に表示させる表示データを切り替えるための信号をシステム制御部7に送出してもよい。システム制御部7は、制御スイッチ16からの信号を受けて所望の状態になるように各回路を制御する。例えば、イコライザー機能を用いずに音楽再生をする際には、制御スイッチ16からのユーザの指示に基づいて、システム制御部7は使用する周波数パターンを周波数特性がフラットなパターンに強制的に切り替えるようになっている。

【0036】次に、音楽再生装置15の電源について説明する。音楽再生装置15には、音楽再生装置15内の各回路に電力を供給するための2次電池11が内蔵されている。2次電池11としては、ニッケル水素電池やリチウムイオンなどを用いることができる。また、音楽再生装置15は、2次電池11を充電するための充電回路10を内蔵している。充電回路10は電源線60に接続されている。電源線60は第1の入出力インターフェース3のコネクタの所定のピンに接続されている。音楽再生装置15がPC1の図示しないPCカードスロットに差し込まれて、第1の入出力インターフェース3がPC1のPCMCIA-インターフェースに接続されると、第1の入出力インターフェース3のコネクタの所定のピンにはPC1側から例えば5Vあるいは3.3Vの電圧が供給されるようになっている。従って、音楽再生装置15がPC1に接続されると、信号線60を介してPC1側から充電回路10に所定の電圧が印加され、それに

基づいて2次電池11を充電することができるようになっている。

【0037】また、2次電池11を充電しつつ2次電池11側から各回路に対して、例えば2.4Vの電圧を印加することができるようになっている。また、2次電池11の出力端は昇圧回路12にも接続されており、昇圧回路12からは3.3Vの電圧が各回路に印加できるようになっている。このように、本実施の形態による音楽再生装置15では、PC1から電源の供給を受けることができるので内蔵の2次電池11の消耗はない。なお、外部ACアダプタ(図示せず)を用いる必要が生じる場合には、図中破線で示したように外部ACアダプタ端子13を設けるようにしてももちろんよい。

【0038】次に、本実施の形態による音楽再生装置15の構造例を図3を用いて説明する。図3(a)は、PCMCIAの規格に基づくPCカードの物理的仕様におけるタイプIIで構成した音楽再生装置15の分解斜視図である。図3(b)は本実施の形態による音楽再生装置15に差し込んで使用されるメモリーカード2としてのCFの構造を示す分解斜視図である。図3(a)、

(b)において、メモリーカード(CF)2は、基板上に実装されたメモリコントローラやメモリチップ等の電子部品26と、50ピンのコネクタ17と、筐体の表裏両面を形成する金属パネル19とを備えている。金属パネル19を固定すると、筐体の図中矢印方向の両側面に、音楽再生装置15のフレーム20で形成されるガイドに沿ってメモリーカード2を差し込むことができるガイド溝38が形成されるようになっている。

【0039】音楽再生装置15は、基板22上に図1で説明したシステム制御部7や充電回路等を含む複数の電子部品23が実装されている。また、基板22上には2次電池11も搭載されている。基板22の一端面に第1の入出力インターフェース3の物理層インターフェースを構成するコネクタが取り付けられ、対向する他端面に第2の入出力インターフェース4の物理層インターフェースを構成するコネクタが取り付けられる。

【0040】これらの部品が実装された基板22の周縁をフレーム20の2本のフォーク部39内方にはめ込み、筐体の表裏両面を構成する金属パネル21をフレーム20の上下から挟み込んで固定する。フレーム20の2本のフォーク部39と基板22の第2の入出力インターフェース4側のコネクタ部とで、メモリーカード2を差し込むことができる空間が構成される。メモリーカード2のガイド溝とフレーム20の各フォーク内方のガイドとを位置合わせしてこの空間にメモリーカード2を差し込むと、コネクタ17と第2の入出力インターフェース4側のコネクタ部とを接続することができる。

【0041】また、フレーム20の両フォーク先端部にはヘッドホンやマイクなどを接続可能な入出力端子14と、制御スイッチ16が設けられている。フレーム20



の両フォーク内にはフレーム20から絶縁された金属配線が施されており、この金属配線により入出力端子14や制御スイッチ16は基板22上の電子部品23の所定回路と電氣的に接続されている。

【0042】次に、本実施の形態による音楽再生装置15の動作について図1乃至図4を用いて説明する。図4は、PC1、音楽再生装置15、及びメモ리카ード2の抜き差しの状態を示す図である。まず、図4に示す音楽再生装置15がPC1のPCカードスロット31に挿入され、メモ리카ード2が音楽再生装置15に差し込まれている状態での動作について説明する。第1の入出力インターフェース3は、PC1から入力された例えばデータ信号のエラー検出/プロトコル処理等を行ったり、PC1側が音楽再生装置15をデバイス認識するための制御を行ったりする。このとき、第1の入出力インターフェース3は、システム制御部7とPC1との第1の入出力インターフェース3を介した制御手順を実現するために、システム制御部7から送出されたデータをPC1側のPCMCIA-インターフェースに適するデータに変換する。また、第1の入出力インターフェース3は、PC1から送出され第1の入出力インターフェース3を介してパラレル変換されたデータやコマンドをシステム制御部7が解釈できる形式に変換したり、システム制御部7に適した電氣的インタフェースに変換する処理を行う。

【0043】第2の入出力インターフェース4は、メモ리카ード2から入力された例えばデータ信号のエラー検出/プロトコル処理等を行ったり、メモ리카ード2側が音楽再生装置15をデバイス認識するための制御を行ったりする。このとき、第2の入出力インターフェース4は、システム制御部7とメモ리카ード2との第2の入出力インターフェース4を介した制御手順を実現するために、システム制御部7から送出されたデータをメモ리카ード2側のインターフェースに適するデータに変換する。また、第2の入出力インターフェース4は、メモ리카ード2から送出されたデータやコマンドをシステム制御部7が解釈できる形式に変換したり、システム制御部7に適した電氣的インタフェースに変換する処理を行う。

【0044】このように本実施の形態による音楽再生装置15は、PC1に設けられたPCカードドライブ装置のスロット31に挿入して接続することにより、従来のPCカードと同様のインターフェース動作を行う。なお、本実施の形態では、第1の入出力インターフェース3にPCMCIAの規格に準拠したPCカードインタフェースを有する場合を例にとって説明しているが、既に説明した他のPCカード、例えば、「Compact Flash」、「Small PC Card」、「Miniature Card」、「SmartMedia」、「MultiMedia Card」、「メモリースティック」に用いられるインターフェースを第1の

入出力インターフェース3に持たせるようにしてももちろんよい。さらに第1の入出力インターフェース3は、PCカードインターフェースに限られず、USB(Universal Serial Bus)規格に対応したインターフェースでもよいし、あるいは、IEEE1394規格に対応したインターフェース等で構成してももちろんよい。

【0045】このように、メモ리카ード2を音楽再生装置15に挿入後、PC1のPCカードスロット31に音楽再生装置15を挿入して電氣的に接続すると、PC1のCPUと、メモ리카ード2内のコントローラを介してカード認識情報のやり取りが行われる。そして、メモ리카ード2の接続を確認すると同時に、PC1から第1の入出力インターフェース3のコネクタ内の所定の電源ピンを介して、充電回路10に電圧が印加され、2次電池11に電源が供給されると共に、2次電池11から各回路に電力が供給される。

【0046】さて、上述のようなインターフェース動作が完了したら、PC1に内蔵された磁気ディスク装置に記憶されている音楽データを取り出して、第1の入出力インターフェース3、信号線50、及び第2の入出力インターフェース4をこの順に経由してメモ리카ード2の固体メモリへ記録することが可能になる。

【0047】また、その逆に、メモ리카ード2内の音楽データを取り出して、第2の入出力インターフェース4、信号線50、及び第1の入出力インターフェース3をこの順に経由してPC1に内蔵された磁気ディスク装置に記録することが可能である。なお、これらのPC1とメモ리카ード2との直接的なデータ転送において、転送される音楽データに対してシステム制御部7を用いて暗号化処理を施すことも可能である。PC1とメモ리카ード2との間で音楽データの転送をする際の制御はシステム制御部7で行うが、システム制御部7による制御は、PC1からの指示または制御スイッチ16からの指示により開始される。

【0048】次に、入出力端子14の入力端子から音楽データを入力して記録する場合について説明する。まず、入力したアナログの音楽データはコーデック9によりデジタルデータに変換される。必要であれば既に説明したDSP8によりデータ圧縮を行い、PC1の磁気ディスク装置に記録する場合には、システム制御部7を介して第1の入出力インターフェース3を活性化してPC1側に音楽データを出力する。メモ리카ード2に記録する場合にも、必要であればDSP8によりデータ圧縮を行い、システム制御部7を介して第2の入出力インターフェース4を活性化してメモ리카ード2に音楽データを出力する。なお、入出力端子14から入力する音楽データには「ID3タグ」等の情報は付加されていない。そこで、制御スイッチ16を操作して、音楽テーブル18に既に格納されている多数の周波数パターンから任意の



パターンを選択して、メモリカード2に記録される音楽データに当該周波数パターンを示す情報を付加することも可能である。

【0049】次に、入出力端子14の出力端子にイヤホン等を接続して音楽を再生して聴く場合について説明する。まず、PC1内の磁気ディスク装置に記録された音楽データを再生するには、第1の入出力インターフェース3を介して音楽データを入力する。入力された音楽データは信号線52を通過してシステム制御部7を経由して、必要であれば既に説明したDSP8によるデータ伸

長を行い、コーデック9によりアナログの音楽データとして出力する。メモリカード2に記録された音楽データを再生する場合も、第2の入出力インターフェース4を介して音楽データを入力する点以外は上述と同様である。

【0050】以上の動作においてシステム制御部7は、音楽データの再生開始の指示を受け取ると、再生する曲のID情報に基づいて音楽テーブル18から所定の周波数パターンを選択し、当該曲の音楽データを所定の周波数パターンで加工するようにDSP8あるいはコーデック9に指示する。DSP8あるいはコーデック9は指定された周波数パターンに基づき原音に対するイコライザ

ーとして機能する。このように、曲毎のID情報に基づいて所定の周波数パターンが選択されて当該曲の音楽データを加工するので、ユーザ自身は何らの操作をしなくても自動的にイコライザ機能が働くようになる。

【0051】次に、PC1を用いて音楽テーブル18に所望の周波数パターンを格納する手順について説明する。音楽テーブル18に格納される周波数パターンは、PC1上でユーザが新規に作成し、あるいは既存の周波数パターンを編集して音楽テーブル18内に格納することができるようになっている。従って、曲のジャンルの雰囲気に合わせてたり、再生スピーカの配置場所に依存した音質の変化を補正したり、ユーザ独自の好みで曲の質感を変更したり、さらには、再生装置固有の再生音のバラツキを補正したりする周波数パターンの新規作成あるいは編集は、PC1上でシミュレーション等を用いて容易に得ることができる。得られた周波数パターンは第1の入出力インターフェース3を介してPC1から音楽テーブル18に格納される。

【0052】また、システム制御部7は、制御スイッチ16を通じてユーザからの記録／再生モードを切り替えたり、記録／再生の媒体をPC1の磁気ディスクにするかメモリカード2にするかを切り替えたりする制御を行う。また、システム制御部7は表示器制御部5を制御して、制御スイッチ16からの指示に応じて表示器6に適宜必要な情報を表示させる。また、以上の動作の最中において、PC1側から第1の入出力インターフェース3を介して充電回路10に電圧が印加されており、2次電池11は充電されながら音楽再生装置15内の各回路に

電力を供給している。

【0053】次に、図4において、音楽再生装置15がPC1のPCカードスロット31から引き抜かれており、メモリカード2は音楽再生装置15に差し込まれている状態で音楽再生装置15を動作させる場合について説明する。まず、制御スイッチ16をユーザが操作することにより、音楽再生装置15の電源をオンにする指令が入力されると、2次電池11から各回路に電力が供給される。このとき、第1の入出力インターフェース3は実質的に機能を停止するようにシステム制御部7による制御が行われる。一方、第2の入出力インターフェース4は、上述と同様の動作で、メモリカード2からのデータ信号等のエラー検出／プロトコル処理等を行ったり、音楽再生装置15側がメモリカード2をデバイス認識するための制御を行ったりする。

【0054】入出力端子14の出力端子にイヤホン等を接続して、メモリカード2に記録されている音楽データを再生する際には、第2の入出力インターフェース4、信号線52、及びシステム制御部7を経由して、また、必要であればDSP8によるデータ伸長も行って、コーデック9を介してアナログ音楽データを出力する。

【0055】また、入出力端子14の入力端子から音楽データを入力して記録する場合は、入力されたアナログの音楽データをコーデック9でデジタルデータに変換する。必要であればDSP8によりデータ圧縮を行い、システム制御部7を介して第2の入出力インターフェース4を活性化してメモリカード2に音楽データを出力する。

【0056】以上の動作において、システム制御部7は音楽データの再生が開始されると、曲毎のID情報に基づいて音楽テーブル18から所定の周波数パターンを選択して当該曲の音楽データを加工するようにDSP8あるいはコーデック9に対し、選択した周波数パターンのデータを出力する。この場合においても曲毎のID情報に基づいて所定の周波数パターンが選択されて当該曲の音楽データが加工されるので、ユーザ自身は何らの操作をしなくても曲毎に所望のイコライザ機能を働かせることができる。

【0057】また、以上の動作において、システム制御部7は、制御スイッチ16を通じてユーザからの記録／再生モードを切り替えたり、記録／再生媒体を別のメモリカード2に切り替えるための制御を行う。また、システム制御部7は表示器制御部5を制御して、制御スイッチ16からの指示に応じて表示器6に適宜必要な情報を表示させる。以上の動作が実行されている間、2次電池11から各回路に対して電力が供給され続ける。また、本実施の形態による音楽再生装置15によれば、メモリカード2を差し替えることにより、複数の音楽データを差し替えて聞くことができる。

【0058】本発明は、上記実施の形態に限らず種々の

変形が可能である。例えば、上記実施の形態においては、第2の入出力インターフェース4を用いてメモリカード2に音楽データを記録する例を示したが、本発明はこれに限られない。例えば、音楽再生装置15内に別の記憶装置を内蔵するようにしてもよい。この場合、第2の入出力インターフェース4を設けずに、つまり音楽再生装置15内のみに音楽等を記憶する記憶装置を設けてもよいし、第2の入出力インターフェース4と共に外部のメモリカード2と併用するようにしてもよい。このような記憶装置を内蔵させることにより、PC1から音楽再生装置15が引き抜かれて、且つメモリカード2がない場合でも音楽等の記録／再生ができるようになる。

【0059】また、上記実施の形態では、2次電池11は音楽再生装置15内に固定されているが、本発明はこれに限られず、2次電池11を取り外し可能に搭載するようにしてもよい。2次電池11を取り外し可能にすると、外部のACアダプタ及び充電器を用いて予備の2次電池11を充電させることができるようになる。さらに、2次電池11の代わりに乾電池を利用することも可能である。但し、2次電池11と乾電池を併用するには、乾電池が用いられる際に充電回路10の充電機能を停止させる機構を設けることが望ましい。

【0060】また、上記実施の形態では、MP3によるデータ圧縮方式を例にとって説明した。従って、音楽テーブル18内の周波数パターンを選択する際にMP3データファイル内のIDタグ3のID情報を利用しているが、本発明はもちろんこれに限られず、別のデータファイル形式でのID情報を利用することも可能である。

【0061】

【発明の効果】以上の通り、本発明によれば、ユーザ自身が操作しなくても曲毎に所望のイコライザー機能が働く音楽再生装置を実現できる。

【図面の簡単な説明】

【図1】本発明の一実施の形態による音楽再生装置の概略の構成を示すシステムブロック図である。

【図2】本発明の一実施の形態による音楽再生装置で用いられる周波数パターンの例を示す図である。

【図3】本発明の一実施の形態による音楽再生装置の概略の構造を説明する図である。

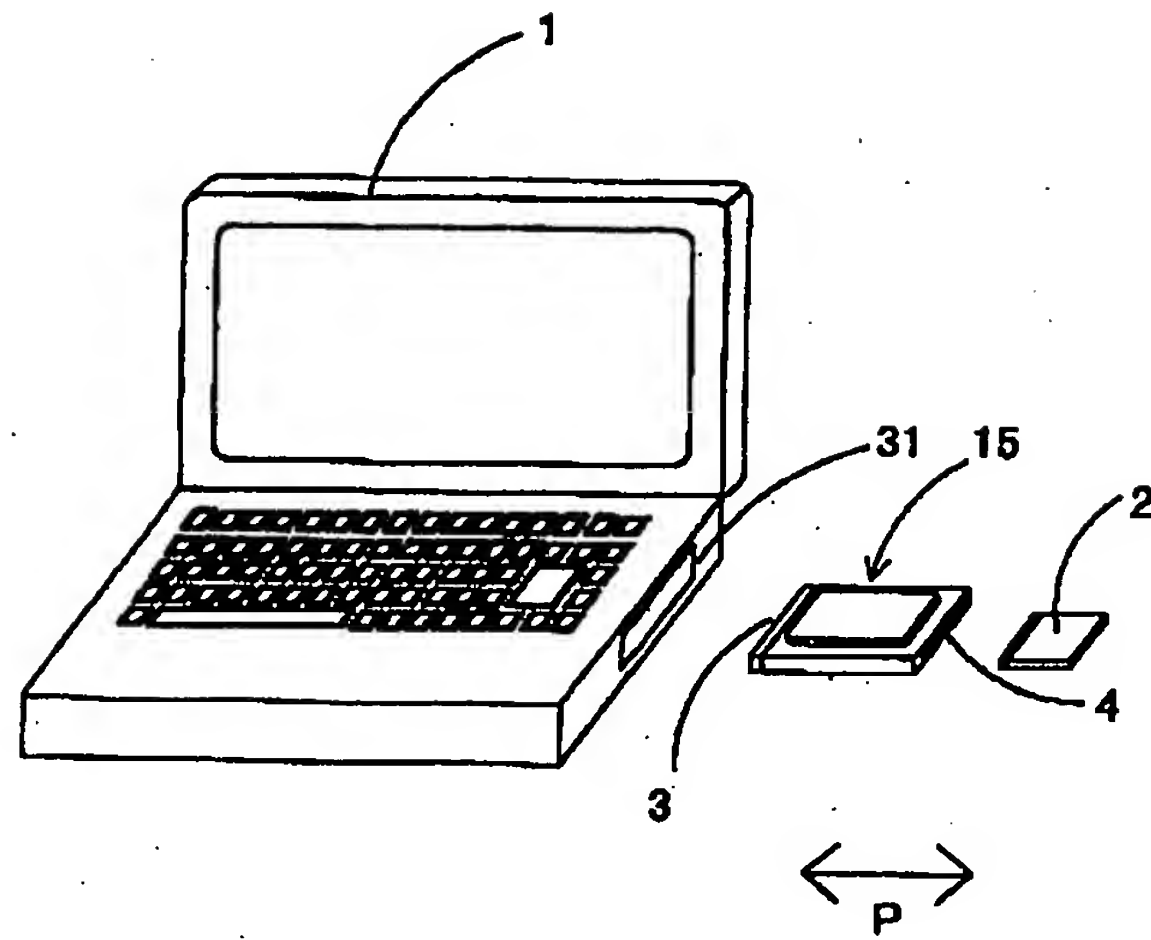
【図4】本発明の一実施の形態による音楽再生装置の使用方法を説明する図である。

【符号の説明】

- |                |                |
|----------------|----------------|
| 1              | PC             |
| 2              | メモリカード(CF)     |
| 3              | 第1の入出力インターフェース |
| 4              | 第2の入出力インターフェース |
| 5              | 表示器制御部         |
| 6              | 表示器            |
| 7              | システム制御部        |
| 8              | DSP            |
| 9              | コーデック          |
| 10             | 充電回路           |
| 11             | 2次電池           |
| 12             | 昇圧回路           |
| 13             | 外部ACアダプタ端子     |
| 14             | 入出力端子          |
| 15             | 音楽再生装置         |
| 16             | 制御スイッチ         |
| 17             | コネクタ           |
| 18             | 音楽テーブル         |
| 19、21          | 金属パネル          |
| 20             | フレーム           |
| 22             | 基板             |
| 23             | 電子部品           |
| 30             | ガイド溝           |
| 38             | フォーク部          |
| 50、52、54、56、58 | 信号線            |
| 60             | 電源線            |



【図4】



フロントページの続き

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